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The OIL AND GAS JOURNAL

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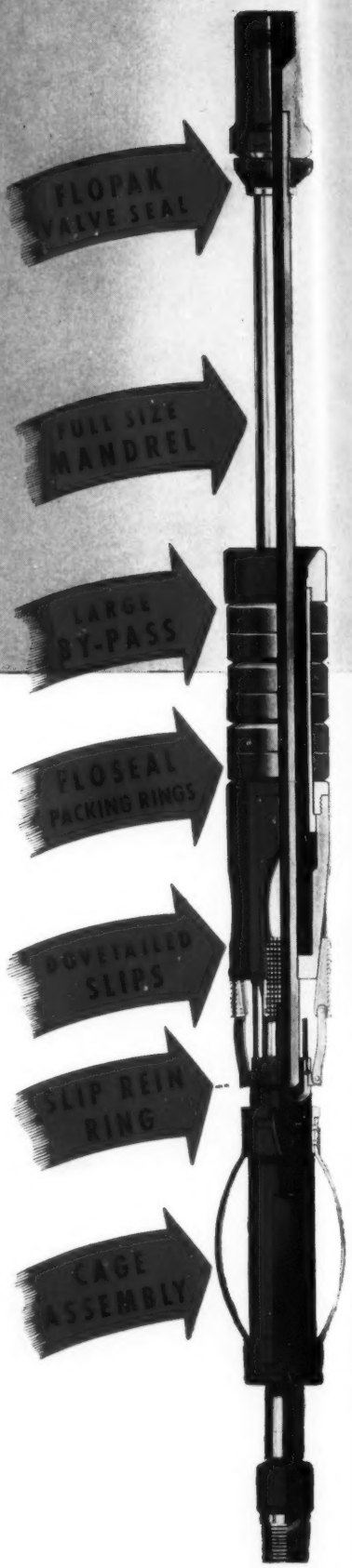

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MANDREL—Extra long to permit 30" stroke valve for deep wells.
—Internal diameter same as tubing string
—Jarring shoulder lifts cone on upward movement to free slip grip
—Keyed to cone to prevent mandrel rotation permitting use of safety joints, testing tools, etc., above packer.

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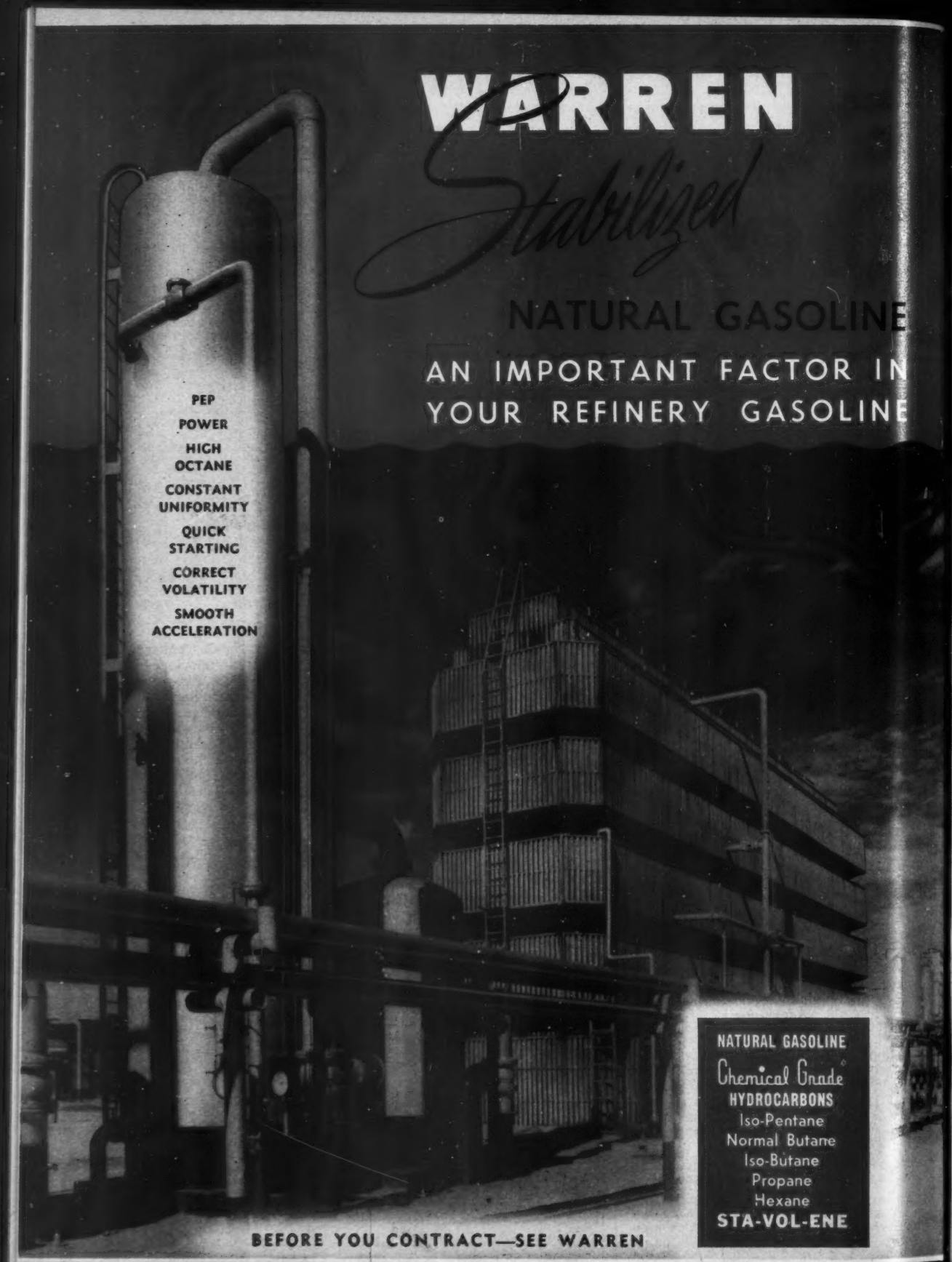

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THE OIL AND GAS JOURNAL

The Middle East

RECENT developments involving changes in ownership and plans for large-scale expansion in what in oil parlance has come to be known as the "Middle East," are attracting attention in world capitals everywhere. More and more it is realized that these vast petroleum reserves will have more to do with the future course of world events than all the political juggling that has taken place over the past 18 months in the efforts to bring about official peace and to establish the U.N. organization.

The petroleum facts regarding this oil that lies at the crossroads of the Eastern Hemisphere can be briefly summarized. Around the Persian Gulf including Saudi Arabia, Iran, Bahrein, Kuwait, and Qatar, and in northern Iraq, a few fields have proven reserves in excess of those of this country. While many have been slow in accepting the mammoth reserves credited to the larger fields, the additional geological facts and operating experiences of the past year are all on the side of those who now accept the top figures.

It also appears logical to assume that with most of the area yet to be explored for oil, additional major discoveries are assured. It does not matter so far as this postwar generation is concerned whether the area has 20 or 100 billion barrels of accessible oil. The controlling fact is that there is sufficient oil to supply the eastern part of the world with the fuel and power needed to bring about rehabilitation and industrial expansion.

The Middle East, prewar, was within the British sphere of influence and the first fields were discovered and developed by British-controlled companies. More recently the American operations have assumed major proportions. Now a realignment of American, British, Dutch, and French interests appears desirable in order to provide the large expenditures that will be required to assure transportation, refining, and distribution facilities.

There are the usual charges that a small group of companies seeks monopolistic control of oil operations, coupled with American and British dominance over the entire area where economic, racial, and religious differences have been reflected in constant political upheavals for many years.

This is not an accurate analysis of conditions. The Middle East countries are being recompensed liberally for concessions and the oil that is brought to the surface. Governments now have the revenue with which to end the impoverishment of many centuries. Thousands of nationals have been trained in the arts and skills of the petroleum industry.

So long as there is private oil development there will be competition and efficient operation, and an acceptance of the many economic and social responsibilities that are part and parcel of Middle East oil. The only question is whether or not there is sufficient statesmanship among the powers recently allied in war to permit this new oil to be utilized, as in this country, to bring about a general improvement in the standard of living in that hemisphere where 70 per cent of the population live.

A.P.I. Assigned ZoBell Patent on Use of Bacteria in Oil Production

THE possibility of using certain types of bacteria to increase the recovery of oil from subterranean deposits is suggested by a U. S. patent recently issued to Dr. Claude E. ZoBell, associate professor of microbiology at the University of California's Scripps Institution of Oceanography. The invention described by the patent relates to an improved process for increasing or facilitating the recovery of oil, gas, or other valuable fluids from fluid-bearing earth formations.

Dr. ZoBell assigned the patent to the American Petroleum Institute for the free use of the public. The Pennsylvania Grade Crude Oil Association, also a nonprofit organization, has been cooperating in the investigations during the last 2 years in attempting to apply the discovery to the recovery of oil under field conditions.

Use of bacteria to release oil from sand is still in a test-tube stage at the Pennsylvania Grade Association's Bradford, Pa., production - research laboratory, but the region's secondary-recovery operators stand ready to make field tests when the laboratory gives a go-ahead signal. Successful adaptation to field operations would increase the nation's oil reserves tremendously.

The association late in 1944 undertook, under a cooperative agreement with the A.P.I., to test under field conditions the discovery of ZoBell that certain bacteria can release petroleum from oil sands. ZoBell is a consultant to the association. The association's bacteriologist, Dr. Jay V. Beck, has tested exhaustively the possibilities of applying bacteria in field and the potential methods. Many problems await investigation and solution before actual introduction of bacteria to field can be made.

Laboratory Tests Encouraging

Beck has demonstrated experimentally the ability of certain cultures of sulfate-reducing bacteria to release oil in promising amounts from ground-up samples of Bradford oil sand. Water containing selected cultures of oil-releasing bacteria was forced through solid diamond - core sections of oil-bearing sand rock, several inches long. Bacteria penetrated oil sand rock in these experiments, traveling 3 in. per week, indicating possible ability to penetrate actual producing sands from input to producing wells. Bacteria considered effective are harmless to humans. ZoBell and Beck found no indication they impair quality of the petroleum.

Water - flood operators were intrigued by the idea of injecting bacteria with water under pressure to oil sands to get 30 per cent of original content not available by any known methods. Introduction of bacteria through water-input wells depends on further laboratory experiments. Receiving study also is the use of bacteria to remove paraffin deposits from producing wells and control of bacteria clinging to the water-input-well sand face, causing lower water intake and decreased oil output.

Hearings Opened on Import Reductions

WASHINGTON. — Arguments against reduction in import taxes on petroleum products were scheduled to begin January 17 before the Committee for Reciprocity Information. A schedule of hearings was announced last week.

Between 600 and 800 witnesses are scheduled to appear on the Government's proposal to negotiate reciprocal-trade agreements with 18 foreign nations, and the majority of these probably will oppose duty reductions on specific commodities. General hearings were held the first part of this week before the full committee, an interdepartmental body, with witnesses discussing the general principles of reducing duties and expanding foreign trade. Following this the committee divided into five panels for 3 weeks or more of hearings on specific commodities.

The only appearance scheduled on the oil-import taxes is the Independent Petroleum Association of America, which earlier filed a brief protesting the proposed cuts and asking restoration of the original taxes on crude and certain products which were reduced in the prewar agreements with Venezuela and Mexico.

The original hearings schedule listed the Arabian American Oil Co., but this was withdrawn with the explanation that the error was caused by misinterpretation of a letter from the company inquiring when the hearings would be held. Officials of the company stated that they have no intention of taking any part in the controversy over petroleum import restrictions.

(Comments on the import-reduction hearings will be found in Watching Washington, page 46).

O'Mahoney Asks Delay In Big Inch Disposal

WASHINGTON. — An attempt to hold up disposition of the Big Inch pipe lines until there can be more congressional hearings is being made by Sen. Joseph C. O'Mahoney of Wyoming.

Together with Sen. Chapman Revercomb of West Virginia, he has introduced a resolution to withhold action for 90 days pending congressional investigation of the effect of the Big Inch on all fuel industries. O'Mahoney said the attempt of War Assets Administration to consider only the highest price ignores congressional objectives of avoiding dislocating the economy of any industry and of protecting small business, adding that use of the lines for natural gas will not only injure the coal and railroad industries but will result in an uneconomic use of the most valuable source of synthetic gasoline. At the same time O'Mahoney introduced a bill to double the present 5-year $30,000,000 synthetic-fuel program of the Bureau of Mines.

As outgoing chairman of the surplus-property subcommittee of the Senate military - affairs committee, O'Mahoney also filed a report highly critical of WAA and asking further congressional study of the Big Inch disposal.

NPC Gets Office, Prepares For January 21 Meeting

WASHINGTON.—The National Petroleum Council expects to get organized for a busy year at its quarterly meeting January 21, when one of the principal matters of business will be selection of officers and approval of a budget.

A headquarters office has been obtained at 1025 Connecticut Avenue, Washington, which will house the secretary and whatever staff assistants may be authorized.

Temporary Chairman Walter S. Hallanan has called the agenda committee to meet in the new quarters January 20 to go over the slate of business to be brought up at the council meeting, including a number of projects selected by Max W. Ball, new director of the Oil and Gas Division.

Warren to Convert Dry-Cargo Ship into First L.P.G. Tanker

PURCHASE of a Type C1A dry-cargo ship which will be converted within the next few months into the world's first tanker designed solely for transportation of liquefied petroleum gases in coastwise and export trade, has been announced by Warren Maritime Corp., wholly owned subsidiary of Warren Petroleum Corp.

The cargo ship, constructed in 1944, was purchased from the U. S. Maritime Commission. The vessel is 416 ft. in length, has a beam of 60 ft., a cargo capacity of 6,700 tons, draws 23½ ft. of water when loaded, and is powered with 4,000 hp. of oil-fired steam turbines, capable of driving the ship at 14 knots.

Conversion will be accomplished by installing in the ship approximately 80 large-capacity, high-pressure cylindrical tanks with a total capacity of about 35,000 bbl. In order to make the installations, a sizeable portion of the deck and superstructure will have to be removed and then replaced after the tanks are anchored in place. The conversion will be done by Pennsylvania Ship Yards, Inc., Beaumont.

Warren Maritime Corp. was organized in October 1946, with W. K. Warren, president of Warren Petroleum, as chairman of the board and president. Other officers are J. A. LaFortune, executive vice president; J. A. Padon, H. E. Felt, and G. L. Brennan, vice presidents; J. E. Allison, vice president and general counsel; A. J. Murphy, treasurer; John T. Oxley, secretary; Murphy and D. M. Mattocks, assistant secretaries; and Oxley and A. B. Clark, assistant treasurers.

New Measures to Give Slight Relief In L.P.G. Tank-Car Shortage

WASHINGTON.—Minor measures to improve shipment of liquefied petroleum gas in pressure tank cars have been taken by the Office of Defense Transportation, but officials hold out no hope that the car shortage will improve materially for many months.

At the suggestion of ODT the Association of American Railroads has authorized owners and users of pressure tank cars to paint the domes white so that they may be readily recognized by switching crews, and all railroads are directed to expedite movement of white-domed cars, while shippers are requested to load and unload 7 days per week.

The Interstate Commerce Commission has amended its regulations to permit the use of tank cars of Class 104A and 104AW for shipment of propane-butane mixtures with a vapor pressure of not exceeding 110 psi. at 105° F. Special permits must be obtained for this use, and they will be valid only during the winter months ending March 15. Ordinarily cars of this class may be used only for straight butane shipments. It is estimated this will make available about 100 cars for butane-propane.

ODT frankly tells all inquirers that the pressure tank cars available will not meet all demands for several months, due to the inability of car manufacturers to obtain sufficient steel to fill orders. It estimates that the country is short at least 745 cars for L.P.G. transport and that this need will increase by 200 cars this month. Various companies have placed orders for more than 2,000 new cars for L.P.G. service, but none was delivered during 1946. With the priority assistance now in effect, ODT expects delivery of 82 new L.P.G. cars in January and 131 in February.

Chief cause of the pressure tank-car shortage is the Army's program of producing fertilizer for export to occupied areas abroad, designed to ease U. S. costs by growing more food locally. The Army is utilizing former powder and munition factories scattered around the country, thus requiring the shipment of anhydrous ammonia and other components long distances by rail. For this program the Army withdrew many pressure cars formerly leased to L.P.G. shippers, but it is still short at least 168 cars and will need 85 more this month and 30 more in February. Private companies have ordered 275 new cars for ammonia service, and priority orders gave them 65 cars produced in December and anticipate delivery of 109 cars in January for ammonia service.

NEXT WEEK
The Annual Number

THIS review and forecast issue of the Journal gives full facts and data on the entire industry for 1946, and projects operations for 1947. Many of the data are based on surveys conducted by the Journal, and they are interpreted to provide a comprehensive view of operations in prospect for the coming 12 months. Many records were broken last year, and these in turn will be broken during the current year.

This is an issue you will want to keep handy all year, providing as it has and will again, the industry's most-relied-upon statistical guide in all its phases.

Elk Basin Gasoline Plant Construction Approved

The Civilian Production Administration has given approval to plans for the construction of a pressure-maintenance and gasoline plant to be built as a part of the unitized operation of Elk Basin field, Wyoming.

Authority to build the plant was granted to Stanolind Oil & Gas Co., designated as operator in the unitized field. The project will be one of the largest of its kind in the Rocky Mountain area. Final agreement to unitize the field, now producing some 16,000 bbl. daily, was reached last summer.

The plant will be built 17 miles north of Powell, near the Wyoming-Montana line, and with auxiliary facilities, will have a capacity of 12,000,000 cu. ft. daily for repressuring. Products will include propane, butane, natural gasoline, and sulfur. Work is due to begin this year.

U. S. Lube-Oil Tax Receipts Gain; Gasoline Total Down

WASHINGTON. — The November report of the U. S. Bureau of Internal Revenue shows receipts from the federal lubricating-oil tax gained more than 16 per cent over November 1945, while collections from the 1½-cent gasoline tax dropped 11½ per cent from the November 1945 total.

The gasoline tax netted $34,427,383.94 in November 1946 against $38,887,065.76 in November 1945. Lubricating-oil tax receipts totaled $7,008,969.17 in November 1946 compared to $6,020,000.53 in the corresponding month of 1945.

Employes Buy Union's Drilling Facilities, Form Independent Firm

LOS ANGELES.—A group of former employes of Union Oil Co. of California have purchased outright all the company's drilling facilities and will go in operation February 1 as an independent drilling contracting firm.

Stockholders in the new Santa Fe Drilling Co. are some 65 former employes of Union Oil. The new Santa Fe Drilling Co. has an authorized capital stock of $500,000. Union Oil will henceforth have all its drilling done by contractor operators.

An announcement said the formation of the new organization is "an example of free enterprise in its most effective form" and emphasized that Union has no subsidiary interest whatever in the new company.

Officers of Santa Fe Drilling Co. are J. D. Robinson, president; R. A. Powell, secretary-treasurer; with H. P. Wickersham, Frank Gess, Howard Robinson, Leo Goss, and Kent Garner completing the board of directors. All of these men have been chosen to their respective offices because of long experience and recognized talent in some important phase of drilling operations, the announcement said. Robinson was general drilling superintendent for Union Oil Co. prior to the formation of the drilling organization; Powell, an accountant; Wickersham, chief mechanical engineer; Gess, district drilling foreman, Coast division; Howard Robinson, district drilling foreman, southern division; Goss, district drilling foreman, Valley division; and Garner, an experienced driller.

J. D. Robinson and R. A. Powell will be president and secretary-treasurer of the new Santa Fe Drilling Co., organized by a group of Union Oil Co. of California employes who have bought Union's drilling facilities

The new company will start out with complete facilities, including drilling equipment; cars, trucks, and mobile units; office buildings, warehouses, tool racks, etc., and will operate 10 strings of tools and 2 strings of repair tools. Operations in the initial stages will be in the western states but will not necessarily be confined to any sectional or even domestic area, the announcement continued.

In addition to drilling and well-repair work, the new company is set up to provide oil-field mechanical-engineering service and also will offer service on mud-control and related problems. Headquarters will be in Santa Fe Springs, Calif., where a considerable portion of the existing Union Oil Co. field quarters has been purchased as part of the total agreement.

Colorado Interstate, Canadian River Gas Companies Propose New Denver Line

WASHINGTON.—Colorado Interstate Gas Co. and Canadian River Gas Co. have field a joint application with the Federal Power Commission for authority to construct a new pipe line to Denver. Two alternate plans are proposed.

If sufficient gas can be obtained from Hugoton field in Kansas, the Colorado company asks to build immediately a 20-in. line from Denver 207 miles to Holly, Colo., and a 16-in. line 50 miles to Hugoton. As market requirements increase Colorado would build a 16-in. line from Holly to the Oklahoma-Texas line, 110 miles and from there Canadian would build 60 miles of 16-in. line to Panhandle field. This project would cost $11,630,400 and move 84,000,000 cu. ft. daily initially and 125,000,000 to 179,000,000 cu. ft. eventually.

The alternate project, which would cost $15,224,000, is for Colorado to lay 268 miles of 20-in. line from Denver to the Oklahoma-Texas border and Canadian would continue to Panhandle field.

At the same time, Colorado-Wyoming Gas Co. field an application, contingent upon F.P.C. approval of the Colorado company's new line to Denver, authority to loop its line from Denver to Cheyenne, Wyo., at a cost of $1,415,000 to increase its capacity from 23,000,000 to 35,000,000 cu ft. daily. *(See Natural Gas News, page 100, this issue, and page 92, January 11).*

Penn-York Natural Gas Corp. has applied to F.P.C. for permission to export gas to the Province of Ontario, Canada, and to construct 65 miles of 10 and 14-in. line from York, N. Y., to Niagara River near Lewiston, N. Y., at a cost of $1,235,610. Penn-York would buy gas from New York State Natural Gas Co. and sell to Dominion Natural Gas Co., Ltd., deliveries varying between 15,000,000 and 18,500,000 cu. ft. daily.

Steady Supply of Jet Fuels Assured in U. S.

WASHINGTON.—Research on aviation fuels by the Department of the Interior during the past year determined that at least 30 of this country's well-known crudes are suitable for the production of jet-propulsion fuels, according to the department's published summary of its 1946 activities.

Discovery of the suitability of the various crudes, the summary declared, gives assurance of a steady supply of jet fuels "when the need arises."

Production of helium gas by the government, a guarded secret during the war, totaled 434,190,000 cu. ft. during the last 6 fiscal years, the report said. More than half of the 1946 production of 63,403,345 cu. ft. was reinjected into the underground reservoir in the Cliffside field near Amarillo, Tex. Rising sales of the gas to nongovernment users has indicated a large peacetime commercial market, the summary said.

River Frontage, Dock Bought by Sun Oil Co.

PHILADELPHIA.—Purchase from Pure Oil Co. of a 60-acre tract of land with a dock on the Delaware River, tankage facilities, and several buildings was announced last week by Arthur E. Pew, Jr., vice president of Sun Oil Co. in charge of manufacturing.

Pew said the purchase, which gives Sun 4,000 ft. of river frontage, "provides room for expansion of present Sun Oil Co. facilities at Marcus Hook and fills a definite need for additional tankage facilities."

Pure Oil Co. officials said the sale would cause "no interruption" in its present marketing or terminal operations at its Marcus Hook plant.

_____this week

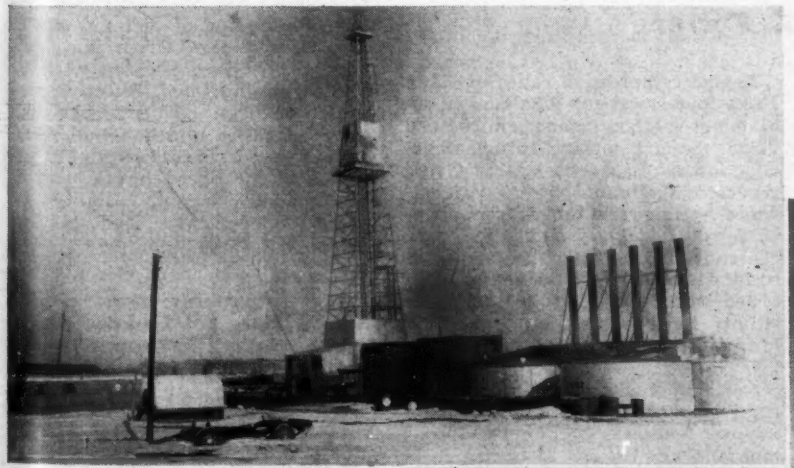
INTERNATIONAL—Cie. Francaise des Petroles, French partner in Iraq Petroleum, institutes legal action in British courts for an injunction against Jersey Standard and Socony-Vacuum's proposed purchase of an interest in Arabian American Oil. . . . French charge violation of "Red Line Agreement" of 1928. . . . Legal fight in prospect. . . . Jersey Standard statement says company was advised "months ago" by its English lawyers that the agreement was voided when French became enemy territory during the war and that it had so notified the other I.P.C. partners. . . . State Department, known to be cool to the "Red Line Agreement," indicates it will reject protest made by the French ambassador. . . . ¶Iranian political situation approaches climax as election of a Parliament gets under way. . . . Political group organized to fight proposed Russian-Iranian joint oil company, charges deal was a "sell-out." . . . U. S. State Department announces no passports to business men will be issued during the election period out of respect to the Iranian law prohibiting discussion of concessions. . . . B. E. Hull, Texas Pipe Line president, and party of engineers and officials prepare to leave early in February to make a reconnaissance of the route of the proposed Trans-Arabian pipe line. . . .

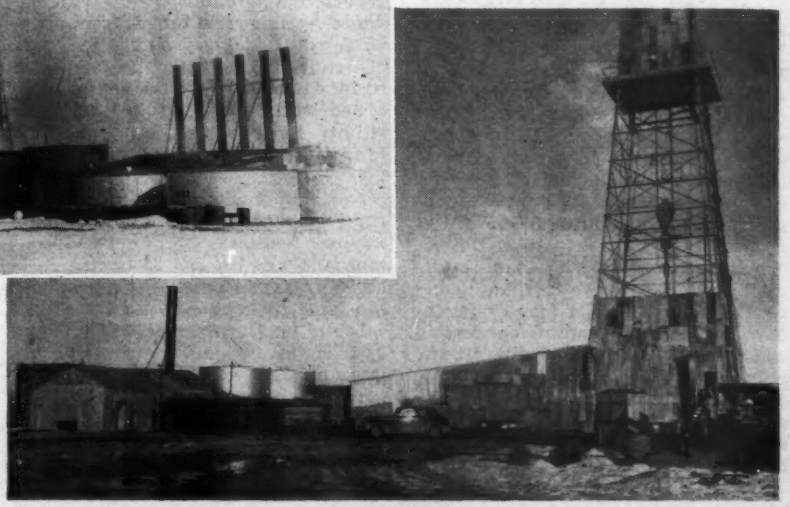
PRODUCTION—Dr. Claude E. ZoBell, University of California scientist, assigns to the American Petroleum Institute his patent on improving oil recovery by bacteriological methods. . . . Patent dedicated to free use of the public. . . . Penn Grade Association says ZoBell's process of using bacteria to release petroleum from oil sands, while promising, is still in the test-tube stage. . . . ¶CPA officials approve plans for construction of pressure-maintenance and gasoline plant in the recently unitized Elk Basin (Wyoming) field. . . . Operator is Stanolind Oil & Gas. . . . ¶U. S. crude production in week ended January 11 shows sharp drop of 114,270 bbl. to 4,561,385 bbl. daily. . . . Middle western cold wave largely responsible.

THE GOVERNMENT—Interior Secretary Krug extends term of NPC members through 1947. . . . Council takes Washington office and prepares for January 21 meeting. . . . Hearings on proposed reduction in import taxes on some petroleum products open in Washington before Committee for Reciprocity Information. . . . I.P.A.A. makes ready its case protesting any reductions and asking that levies be restored to their original 1932 level. . . . ¶Senator O'Mahoney cosponsors resolution in Congress to delay Big Inch disposal pending investigation. . . .

PRICES—Action of Premier Oil Refining in raising East Texas crude price 10 cents to $1.80 per barrel holds attention of marketing officials. . . . Situation closely watched with some observers expecting general advance soon, others predicting it will not come until early spring.

NATURAL GAS—Colorado Interstate Gas, Canadian River Gas asks FPC to approve plans to build new Denver gas line. . . . ¶Colorado-Wyoming Gas proposes construction of Denver-Cheyenne loops in FPC application. . . . ¶FPC approves $4,552,000 construction program planned by Hope Natural Gas in West Virginia. . . .





Largest steam rig and the largest power rig assembly ever operated in the Rocky Mountain Region are shown here after they passed halfway point in their goal of 13,000 ft. They are located on the Church Buttes structure 55 miles west of Rock Springs, Wyo. Both rigs, owned by Rocky Mountain Drilling Co., are drilling wells for Mountain Fuel Supply Co. The steam rig is now drilling about 5 miles northeast of the discovery well. The power rig, employing four 410-hp. gas engines, is drilling about 1 mile west of the discovery well. The photographs were made by Neil Williams, associate editor of The Oil and Gas Journal, whose article on the engineering features of this development will appear in an early issue of the Journal

C. E. FRUDDEN

S. D. HERON

Two leaders of the Society of Automotive Engineers at the annual meeting last week in Detroit were C. E. Frudden, chief engineer of Allis-Chalmers Co., and president of the association for 1947, and S. D. Heron, Detroit, consultant on aviation-fuel research, who presented the Horning Memorial lecture at the meeting

Gasoline Purity, Diesel Needs, And Instrumentation Discussed At S.A.E. Annual Meeting

by Arch L. Foster

DETROIT.—The effect of impurities on the performance of diesel engines and on diesel-engine wear, the correlation of octane number and detonation rating with compression ratios, spark advance and other operating variables in gasoline engines; the remarkable advances in instrumentation during the war and at present for use in research on detonation, on piston temperatures; causes and elimination of smoke in diesel-engine exhausts—these are among the more important subjects reported on and discussed at length at the meeting of the Society of Automotive Engineers January 6 to 10 in Detroit. The adaption of fuel injectors to aircraft fuel systems, a system highly developed in German war craft, the Navy's research program on diesels, and methods of operating aircraft and automotive engines in extremely cold weather and the reintroduction of the sleeve-valve engine are others of the highly important subjects presented before this 100-paper meeting.

Engine compression ratios of 7.3 to 1 are found best for gasolines of 72-81 motor method octane number and 77-86 research octane rating, E. J. Gay and H. T. Mueller, Ethyl Corp., reported. Maximum-power spark advance for this ratio ranges from about 13 flywheel degrees before top dead center (B.T.D.C.) at 800 engine r.p.m. to 28° (BT.D.C.) for 2,400 r.p.m. Fuels tested included those with little sensitivity for different test conditions, to those showing 10 to 12 octane numbers difference between motor and research method results. Difference in spark advance for 70 and 85 octane number fuels was 2.5° for the 70 octane and 8.5° for the 85 octane fuels at 800 r.p.m.; about 14° and 38° for the same fuels at 2,400 r.p.m.

Diesel-engine wear is not affected appreciably by large amounts of organic nitrogen in the fuel, C. C. Moore and W. L. Kent, Union Oil Co. of California, found. Testing an untreated fuel with considerable nitrogen (0.08 per cent), and the same fuel treated to reduce nitrogen to 0.01 per cent, showed little if any difference in wear; 0.16 per cent nitrogen showed no more wear than the other fuels. High sulfur in diesel fuels shows greatly increased wear; three heavy fuels with 0.7 per cent sulfur, a light fuel of no sulfur to which 0.7 per cent thiophene was added showed five times as much wear as the same light fuel without the thiophene. Thiophene is natural constituent of many diesel fuels. Low-wear fuels to which sulfur is added show as much wear as do fuels containing the same content of natural sulfur, proving the effect of sulfur, the authors said. Four fuels containing 0.0, 0.3, 0.7, and 1.3 per cent of sulfur, respectively, showed wear of about 150 mg., 330 mg., 410 mg., and 1,200 mg., respectively in 60 hours operation. Wear rate was determined by analyzing used crankcase oil for iron content.

The "average 65 per cent point" of a fuel's distillation curve is the most representative single value to indicate the fuel's engine warm-up properties, reported J. G. Moxey, Jr., of Sun Oil Co. Moxey pointed out that because of the greatly increased amount of high-boiling, high-octane number components used in present-day and future fuels coming largely from catalytically cracked fuels which show high antiknock in all parts of the distillation curve, a lowered gasoline volatility may be expected in future, and that car manufacturers should keep this in mind in designing future engines.

Well-designed diesel engines in good repair need not smoke if not overloaded, said Dr. P. H. Schweitzer, of Pennsylvania State College. To eliminate "hot smoke" (from slow combustion), the operator should improve the mixing of fuel and air. To stop "cold smoke" (from late ignition), the engine's ignition must be speeded up, he stated. Effective prevention of diesel exhaust smoke with many designs of injection equipment, over-all speed ranges, involves a reduction of low-speed torque, and of the engine's "lugging" ability, its power under heavy load at low speeds.

S.A.E. ABSTRACTS

Effect of Nitrogen and Sulfur Content of Fuels on Rate of Wear in Diesel Engines

C. C. MOORE and W. L. KENT, Union Oil Co. of California

THE amounts of nitrogen and of naphthenic acids in diesel fuels have little effect on rate of wear in the engine as determined by the "chemical" method of testing the amount of iron present in the used crankcase oil. The same fuel containing in one case 10 times as much nitrogen as another sample of the same fuel showed practically the same iron content in the

used lubricating oil. Reduction of naphthenic acid content from 0.3 to zero acid number showed practically no difference in wear (iron content of used oil).

Sulfur content and boiling range show remarkable wear differences. A difference of 550 per cent in wear rate was shown between a fuel of very low distillation range and practically zero sulfur and nitrogen, and three heavier fuels and containing considerable amounts of sulfur. Addition of thiophene sulfur compounds to the light fuel to equal the sulfur content of the heavier fuels (0.7 per cent) caused that fuel to show wear almost identical to that of the heavier fuels. Fuels containing artificially added sulfur showed about the same wear rate as those containing the same amounts of naturally occurring sulfur. Fuels with 1 per cent sulfur of the type tested showed 400 per cent wear increase over fuels with no sulfur; 700 per cent more wear was found with fuels of 1.3 per cent sulfur compared to zero sulfur fuel. A lubricating oil was compounded with an addition agent to combat the effect of sulfur and showed only about one-fourth the wear shown by the same heavy-duty oil used in the major number of the tests.

Navy Diesel-Engine Research

W. F. JOACHIM, U. S. Navy.

IT is not too much to expect higher diesel-power capacities which have reached a value of 12,000 b.hp.; suitable reliability must be maintained. Brake mean effective pressure (b.m.e.p.) has been pushed up to 255 psi., and piston speeds have been raised to 2,820 ft. per minute. The five efficiencies are theoretical efficiency, with higher compression ratios; mechanical, with advanced design using lighter weights for all moving parts; volumetric, to improve gas flow into and out of each cylinder; cooling efficiency and combustion efficiency. Redesign of injector tip alone boosted fuel consumption from about 0.4 lb. per horsepower per hour to 0.375 lb. per horsepower per hour., and reduced cylinder wear from 0.0037 inch to 0.0009 in. Captured German and Japanese diesel engines show high efficiencies, the German E-boat 2,500-b.hp. engine using 20 cylinders in a V-design shows only 4 lb. per horsepower of weight; the newer Daimler-Benz MB-518 engine has only 3.4 lb. per horsepower.

Mutual Adaptation of Aircraft Fuels and Aircraft Engines

S. D. HERON, Consulting Engineer. (Horning Memorial Lecture).

EQUALLY magnificent jobs have been done by the oil-refining industry and by the aviation-engine manufacturers, each in fitting their product to the requirements and peculiarities of the other product, Heron states. The World War 1 Liberty engine, of 1,650-cu. in. displacement, turned out only about 420 b. hp. on 55-octane-number fuel; the World War 2 Rolls-Royce-Merlin engine of the same displacement with fuel of more than 100 octane number produces more than 2,000 b. hp. About half of this improvement can be attributed to each of the two industries involved in the development. Use of synthetic hydrocarbons in great quantities and of tetraethyl lead are mainly responsible for the improvements in fuel performance. Cooperative effort of both industries made all improvements possible.

Rating of fuels according to chemical composition would be very expensive, and would limit greatly the supply of standard-quality fuels. Dr. H. L. Horning, famous leader in fuel-test-method development, referred to the normal-heptane-isooctane "yardstick" as being made of "rubber" but it proved to be better than none, and is now used with little if any extension or compression.

Standardization of S Fuel for testing, and the making of the first large batch represents a landmark of cooperative effort, cost $40,000, and a debt of gratitude is owed to Shell Oil Co., Inc., and Lt. Gen. Jimmie Doolittle who handled it for Shell, and to Standard Oil Co. of New Jersey who joined Shell and both produced this first batch of standard fuel. Pure Oil Co. first standardized the first low primary reference fuel of about 20 octane number; Phillips Petroleum Co. has recently announced high-purity heptane as standard reference fuel at a low cost, another landmark in progress.

The synthesis and isolation of many pure hydrocarbons in the aviation-fuel range by the A.P.I. program have aided immensely in furthering fuel and engine development. Horning early made the facilities of Waukesha Motor Co. available for developing test engines and was a primary power in all this work.

Navy Diesel Fuels

CAPT. W. C. LATROBE, U.S.N.

FUTURE technical requirements for diesel fuels include: Present specifications for normal petroleum fuels, plus compatibility tests as with boiler fuels; demulsibility or soft-water separation or salt-water-retention tests; low end point for fuels for special services. The primary interest of the Navy is to influence by all the means at its disposal the development and manufacture of diesel fuels and engines which will have the highest specific power output possible commensurate with the economy of the nation. Although the Navy has obtained 90-cetane-number diesel fuel from French Fischer-Tropsch process operations for study, time may tell that this produce lacks constituents which are necessary for driving the diesel engines of the future. The number of hydrocarbons in the diesel-fuel range is almost astronomical in comparison to those in gasoline. In the not-too-distant future the Navy may be turning more and more to nonpetroleum sources of liquid fuels. Recent tests show interesting results from the use of fuels from coal, shale oil, and natural gas, aided by contributions from the Navy's friends in the petroleum industry. (Navy) diesel fuels must be pumpable down to temperatures of —40 to —50° F.

Aircraft Engine Starting Tests and Experiences in the Arctic

WILLIAM WEITZEN and R. G. DUNN, U. S. Army.

OIL dilution lengthens engine life in the Arctic, and the authors are very strong in their approval of it. No record of engine failure shows a failure traceable to engine using oil-dilution routine. The coldest starts on turbo-jet engines in Alaska tests showed successful starts on one P-59 and two P-80 planes to about —35° F Big problem is to supply enough starter power to crank the jets up to firing and sustaining speeds; with such power, turbo-jets indicate superior starting power over reciprocating engines at low temperatures. No data are available on starting problems below —35° F.

Frigid Starting and Operation

R. W. GOODALE, Standard Oil Co. of California.

REFINERS have provided for many years gasolines tailored to the weather conditions and making easy starting under any sort of normal conditions. Cloud and pour points are the most important in diesel fuels generally, since these are used also for heating purposes. Crankcase oils reach about the same equilibrium temperatures regardless of outside temperatures; cannot go beyond the engine manufacturers' recommendations in viscosity, as determined by long experience. Ice formation in both gasoline and diesel fuels makes trouble, fuels dissolving 30 to 50 p.p.m. of water. An "ice preventive" has been used in a fraction of 1 per cent, which prevents ice formation down to —50 to —60° F.

Minute Amounts of Cylinder Wear Are Measured With a Microscope

C. S. BRUCE and J. T. DUCK, National Bureau of Standards.

CORROSION appears to be responsible for most of the wear in modern engine cylinders. An instrument of the general form of an indenting tool has been used to measure small-wear values, similar to one developed by Knoop on which patent has been granted to McKee and H. C. Dickinson of the bureau and assigned to the U. S. Government. This tool includes an indenter, an indentation locator, and a microscope fitting into the locator with a graduated scale with 0.01-mm. graduations. Tests show that wear is greatest at the cylinder top, decreasing gradually below the top line.

Engine Warmup With Present-Day Fuels and Engines

J. G. MOXEY, Jr., Sun Oil Co.

PREWAR motor fuels tended continuously toward lighter, lower-boiling products, with little warmup problem. Catalytic cracking has introduced new problems, since the high-boiling fractions are high in octane number. It is not necessary for the refiner to throw away the heavy ends to get higher octane ratings. The author believes the next few years will see a a reversal of the trend toward lighter fuels and a renewal of the problems incident to the use of less-volatile fuels; this new trend is shown in the first postwar survey of motor fuels. Fuel volatility affects the warmup performance of engines; the average 65 per cent evaporated temperature is a good measure of the warm-up ability of fuels. Because of the increased percentage of high-boiling and high-octane-number fractions in postwar gasolines, it will be well for engine manufacturers to keep this in mind and give it due consideration in the design of future engines.

Must Diesel Engines Smoke?

P. H. SCHWEITZER, Pennsylvania State College.

"FOR correcting a normally smoky exhaust the smoke should first be diagnosed; to eliminate 'hot smoke,' the mixing of the fuel and air should be improved; to eliminate 'cold smoke' ignition must be speeded up."

Thus the author passed the buck mainly to the engine and ignition engineers, in correcting engine smoke in diesels. Exhaust smoke may be caused by late injection, which can be corrected merely by advancing injection timing; if this advance cures the smoke, then the problem is solved. Smoke due to long ignition lag may be cured by using higher-cetane-number fuel. By design changes the combustion chamber may be made hotter especially in the spopts where initial ignition takes place. High compression ratio induces hot smoke, low compression ratio makes cold smoke. A normal engine burning normal fuel should show no smoke between one-fourth and three-fourths load. Increase in cetane number should improve cold smoke and aggravate hot smoke. Under normal conditions, between 40 and 60 cetane numbers, the exhaust smoke is fairly independent of the ignition quality of the fuel.

International

WORLD-WIDE OIL DEVELOPMENTS

Pipe Shipments for Bolivian Line Due to Start This Month

NEW YORK.—The first shipment of 6⅝-in. Grade B 17.02-lb. seamless pipe for the 260-mile Bolivian Camiri-Tintin pipe line is scheduled to leave the United States some time this month. Williams Brothers Co. is the contractor.

Indications are that this line will be extended an additional 90 miles to Cochabamba, but the present contract calls only for work between the Camiri oil fields and Tintin. If the line is extended, it is thought that $3,000,000 more will be needed for expenditures. Moreover, the extension reportedly will be the toughest due to the Oriental Mountains which have altitudes of almost 10,000 ft.

The site for the first pumping station, at Camiri, at an elevation of 780 m. (2,570 ft.), is being readied. Electric power for the stations will be supplied by generators belt-driven from the main-line pumping-unit engines. Locations of the other pumping stations will be at Monteagudo, at 6,100 ft., and at Padilla or Alcala. Each will be equipped with two 6,000-bbl. daily diesel-engine-driven reciprocating pumps.

The initial capacity of the line will be 3,000 bbl. daily at 1,500 psi. pressure, with operation plans calling for 6,000 bbl. daily capacity at some future date. The 100 per cent standby capacity is being provided because of the remoteness of the line and the ruggedness of the terrain.

All right-of-way negotiations between Camiri and Tintin have been completed. Williams Brothers Co. is the contractor for Yacimientos Petroliferos Fiscales Bolivianos (Bolivian Government Oil Fields).

Negotiations on the construction of a refinery—presumably to be located at Cochabamba—are reportedly still under way with Foster Wheeler Corp. While an Export-Import Bank loan presumably will be required for refinery construction, the Camiri-Tintin pipe line financing is being carried out entirely by Bolivian government funds.

Pipe for the Bolivian project will be unloaded from ships at Antofagasta, Chile, and shipped by rail to Zudanez, 50 miles east of Sucre, and other convenient points for trucking to the right-of-way.

William Brothers Co. operations are directed from headquarters at Sucre, Bolivia, about 500 miles air-line distance from Antofagasta. At Sucre, T. E. Wainwright is project manager, and George Allen is general superintendent for the contractor.

During 1946 Williams Brothers Co. completed the right-of way work. A spread is being organized with skilled personnel mostly from the United States. Laying of pipe is expected to start in February.

Iranian Passports Are Refused U. S. Oil Men

Passports are being refused to American oil men seeking to visit Iran by the U. S. State Department, an American diplomatic official said in Tehran this week.

The American attitude, he said, is "out of respect to an Iranian law prohibiting discussion of oil concessions." The law, passed in 1944, carries an 8-year imprisonment penalty for Iranians found guilty of discussing oil concessions with foreigners.

Egloff to Address Tulsa Nomads at Annual Dinner

Dr. Gustav Egloff, director of research, Universal Oil Products Co., will be principal speaker at the seventh annual reception and dinner of the Tulsa chapter of Nomads in the Tulsa Club January 31.

Egloff will speak on "Fuels in Scandanavian Countries," covering competitive fuels used during the war in those countries for motor fuels, industrial, household, and other uses.

DR. GUSTAV EGLOFF

The research chemist visited Sweden, Norway and Denmark in August and September of 1946 and observed the use of such indigenous fuels as wood, charcoal, compressed straw, peat, methane gas from fermentation of city sewage, compressed gases from wood carbonization, and motor fuel produced from oil-shale retorting. Egloff, who was graduated from Cornell University in 1912 and received his Ph.D. from Columbia University in 1915, has served as research director for Universal since 1917.

New officers of the Tulsa chapter of Nomads will be announced following the dinner.

Map Corrections Asked

The South American geologic map committee of the Geological Society of America is planning to complete material for the final engraved draft of the South American geologic map by May 1. The committee is asking that all contributors of corrections to the map or manuscript send such material before that date to George W. Stose, U. S. Geological Survey, Washington 25, D. C.

Caltex Oceanic to Handle European African Markets

NEW YORK.—Caltex Oceanic, Ltd., is the newly formed affiliate of Standard Oil Co. of California and The Texas Co. which will handle the distribution of Persian Gulf petroleum products throughout Europe and North Africa for the California Texas Oil Co., Ltd.

This was revealed here late last week when Caltex confirmed negotiations to purchase the European and North African marketing subsidiaries of Texaco. Caltex Oil Products Co., as previously reported, will handle lubricating oil, greases, asphalt, and other petroleum specialty products. Both companies are a joint interest of California Standard and Texaco.

Formation of Overseas Tankship Corp. to handle the transportation of products produced by the joint foreign interests of California Standard and Texaco, was announced last September. Negotiations are now complete for the purchase under the Ship Sales Act of a number of T-2 type tankers, several of which are now being delivered. Overseas Tankship eventually will be one of the world's largest tank-ship operators.

United Overseas Petroleum Co., Ltd., another California Standard and Texaco affiliate, will handle the foreign purchasing and general foreign services required from London offices.

Caltex has operated east of Suez since 1936. Acquisition of European and North African properties now gives this company wide distribution, under the Caltex emblem, throughout the greater part of the Eastern Hemisphere.

The major portion of Caltex petroleum requirements comes from the great crude-oil reserves in the Persian Gulf and Saudi Arabia, produced by the refineries of Arabian American Oil Co. at Ras Tanura, and Bahrein Petroleum Co., Ltd., on Bahrein Island. Large quantities of lubricating oil and specialty products are shipped from the United States.

New Australian Refinery Construction Under Way

NEW YORK.—Construction of Vacuum Oil Co., Ltd.'s 1,300-bbl. daily capacity refinery at Paisley, Australia, is now under way. It is expected to be on stream late in 1947.

While it has been designed primarily as a lubricating plant, an asphalt unit will also be installed. Paisley is 14 miles from Melbourne.

The company is a subsidiary of Standard-Vacuum Oil Co., which is jointly owned by Standard Oil Co. (N. J.) and Socony-Vacuum Oil Co., Inc. (Additional information on this project was published in The Oil and Gas Journal, October 12, p. 60).

Iranan Political Group To Oppose Soviet Grant

Opposition to the proposed Russian oil concession in northern Iran has been voiced by a veteran Iranian politician, Riza Afshar. Afshar terms the proposed oil concession, which the Soviet negotiated under duress and in direct violation of a wartime agreement, a "sell out."

Afshar has announced the formation of a coalition on a platform opposing Premier Ahmed Ghavam's intention to submit the projected oil concession to members of the Majlis (Parliament) for approval. Elections are now under way and are expected to be concluded in about 3 months.

Under terms of the Russian-Iranian oil agreement, a company would be formed in which Russia would control 51 per cent for the first 25 years. If Afshar is elected to Parliament, he will reportedly recommend the formation of an Iranian oil company which eventually would construct a pipe line across Turkey to markets on the Black Sea.

(For other details on the status of the concession, see The Oil and Gas Journal, January 4, page 29).

Venezuela Official Suggests Equal Split of Oil Profits

A suggestion that the Venezuelan Government receive 50 per cent of the profits of American and British companies was made last week by Dr. Juan Perez Alfonso, minister of development in the republic.

Observers expressed belief that the statement, made at a press conference, did not indicate any immediate action by the Venezuelan Government. Alfonso said his government had been considering "for some time" that a 50-50 split "between the government which provides the oil fields and industry which supplies the capital and technique" would offer "greater stability and security of future operations."

Eiche Named President Of Los Angeles Nomads

R. J. EICHE

R. J. Eiche, export representative for several manufacturers of oil-field equipment, has been elected president of the Los Angeles chapter of the Nomads.

Other new officers of the Los Angeles organization are Fred C. Ripley, International Derrick & Equipment Co., vice president; Byron M. Landis, Web Wilson Oil Tools, secretary; Waldo Moore, Cavins Co., treasurer; Lee J. Laird, Chiksan Co., sergeant-at-arms; J. A. Engstrand, Grant Oil Tool Co., assistant secretary; B. Reinhold, Abegg & Reinhold, Ltd., assistant treasurer; Earle M. Boggess, Baker Oil Tools, Inc., deputy sergeant-at-arms; and Ted Sutter, Baker Oil Tools, Inc., and W. F. Bettis, M. O. Johnston Oil Field Service Corp., members of the board of regents.

Site of the Paisley, Australia, refinery, now being built by Vacuum Oil Co., Ltd., a subsidiary of Standard-Vacuum Oil Co. The 1,300-bbl. daily capacity refinery is across Port Phillip Bay from the city of Melbourne. (Photo by Standard-Vacuum Oil Co.)

French Seek British Court Order Against Jersey-Socony Deal

by Warren W. Burns

NEW YORK.—"This fascinating oil business" has never been more evident—from a global viewpoint at least—than now, with the world's daily press publishing fact and some fiction, all concerned with the projected Middle East oil developments, and in every case concerning two major United States oil companies: Standard Oil Co. (N.J.) and Socony-Vacuum Oil Co., Inc.

For the moment, the French oil interests, Cie. Francaise des Petroles and the French Government, which holds 35 per cent of the stock, are in the spotlight. Cie. Francaise is seeking an injunction from British courts to halt Jersey Standard's and Socony-Vacuum's negotiations whereby these companies would become 30 per cent and 10 per cent partners, respectively, in Arabian American Oil Co. Arabian American is now jointly owned by Standard Oil Co. of California and The Texas Co., but these two companies are not involved in the French protests, as they are not partners in Iraq Petroleum Co., Ltd.

The French company protest, in which the French Government itself is playing a leading role, having called the matter to the attention of the British Foreign Office and the United States State Department, revolves around that part of the Iraq Petroleum Co.'s contract known as the "Red Line Agreement" (the significance of which was indicated by The Oil and Gas Journal (December 21, page 42). The question, as previously pointed out, is whether this agreement survived World War 2 intact or is dead.

Jersey Standard and Socony-Vacuum contend that the restrictive agreement became void when France, through German occupation, became enemy territory and thus technically an enemy alien. On the other hand, Cie. Francaise and the French Government are contending that if the "Red Line Agreement" is dead then all prewar contracts between any French and American interests, regardless of what is involved, are equally void. This latter contention will probably come in for some heavy legal opinion.

Moreover, the French point out that it is unfair to ignore the distinction between a real and actual enemy, and before this angle is dropped, it is certain that the British courts will hear about the "force majeure" clause in the Iraq Petroleum contract, dated July 31, 1928. This clause states: "If any party to the contract breaches the agreement by reason of any cause beyond its control, it is relieved from liability for the breach to the extent to which it is due to such cause."

However, it is likely that the dispute may be cleared out of court. Oil officials here in New York think it significant that the French Ambassador to Great Britain, Rene Massigli, since lodging the original complaint, presented an "aide memoire" to the British Foreign Office, January 9, protesting against a breach of the "Red Line Agreement." In view of this, it is thought that since the British and American governments have taken the attitude that the disagreement was purely a commercial one that the French may seek some type of new agreement.

In seeking an injunction to halt Jersey Standard's and Socony-Vacuum's partnership negotiations with Arabian American, Cie. Francaise ignored the arbitration clause in the Iraq Petroleum contract whereby an arbitrator was to be selected, either by the parties concerned or by the High Court of Justice in England, in case of any question of dispute. But as the two American oil companies assumed that the "Red Line Agreement" is dead, a French source here said that "surely any 'liberties' Cie. Francaise takes will be clearly understood by our two American partners."

"Just a Family Squabble"

An interesting angle to the current American-French dispute is the fact that relatively pleasant relations have been maintained between Cie. Francaise representatives and those of Jersey Standard and Socony-Vacuum. "After all, it's just a family squabble," this reporter was told, "and nobody is really angry in that an understanding probably will be reached soon." Meanwhile, the French, perhaps just to point up the situation, have taken the matter to court.

Another misrepresentation given by many newspapers is that the French "are being crowded out of the Middle East." This is not so, for there are seven Iraq Petroleum Co. affiliates outside of the country of Iraq

U. S. Rejects Protest By French Ambassador

WASHINGTON. — The State Department is expected to reject the protest filed last week by the French ambassador, Henri Bonet, against the proposal of Standard Oil Co. (N. J.) and Socony-Vacuum company to purchase an interest in the Arabian American Oil Co.

While the protest has not yet been answered formally, M. Bonet was told that the department regards the proposal as merely a commercial agreement to be settled among the companies involved and not a matter for governmental consideration.

The protest was filed on behalf of the Cie. Francaise des Petroles which, together with the two American companies and British and Dutch interests, is a partner in Iraq Petroleum Co.

Presumably the French Government protested to the U. S. Government because our State Department was instrumental in obtaining for the American companies a right to participate in formation of I.P.C., though the department has always regarded the "Red Line Agreement" as an undesirable restriction on competition.

The present attitude of the State Department is to let the British courts, or the I.P.C. partners themselves, settle this question. However, it is no secret that if the pending Anglo-American petroleum agreement takes effect, the United States will ask to have the "Red Line Agreement" modified or abrogated if it is still in effect at that time.

itself, and in each Cie. Francaise holds the same interests as its American, British, and Dutch partners. Moreover, an Iraq Petroleum geologist has been quoted as saying that the possible crude oil reserves which Iraq Petroleum Co., Ltd., has in Arabia alone may dwarf those of Arabian American—which are in the neighborhood of 20,000,000,000 bbl. No tests have been drilled. Furthermore, Jersey Standard and Socony-Vacuum have evidenced continued interest in Iraq Petroleum—a factor which the French may not have considered significant—in that the two American partners plan to invest $13,400,000 to further that company's oil expansion activities in the Middle East.

Cie. Francaise holds a 23.75 per cent interest in Iraq Petroleum, along with the following which hold equal percentages: Near East Development Corp. (Jersey Standard and Socony-Vacuum); D'Arcy Exploration Co., Ltd., a subsidiary of Anglo-Iranian Oil Co., Ltd., (which in turn is 56 per cent owned by the British Government); Anglo-Saxon Petroleum Co., a unit of Royal Dutch-Shell; and the remaining 5 per cent interest is held by an Armenian, C. S. Gulbenkian, who operates as Participations and Investments, Ltd.

According to the "Red Line Agreement," more correctly known as the "Working Group Agreement," any crude-oil production arrangement entered into by any of the partners in Iraq Petroleum Co., in lands comprising the old Turkish Empire—circumscribed by a red line—should be for the joint account of all partners in Iraq Petroleum. Saudi Arabia, over which the current dispute has arisen, is within the red-line area.

In a statement issued late last week by Jersey Standard, it was explained that "months ago we were advised by English lawyers that the Red Line Agreement, which restricted the operations of the parties so that in a large area of the Middle East they had to act jointly, became void when France, through German occupation, became enemy territory. On receipt of this information the American participants in Iraq Petroleum Co. notified the French and all other parties that they regarded the so-called Red Line Agreement as no longer in effect."

Whereupon Cie. Francaise also engaged English lawyers who hold that the "Red Line Agreement" is still in effect. Moreover, Cie. Francaise has also consulted powerful legal experts in the United States and has been told that the agreement, though restrictive, is not in violation of the antitrust laws of this country—a contention which Cie. Francaise feared might be made. As a matter of fact, the agreement does not constitute a cartel as it does not fix prices, allocate production, or contain any of the other evils related to cartel arrangements. The "Red Line Agreement" merely provided (or provides) for equal opportunity for all Iraq Petroleum Co.'s partners.

However, it is frankly admitted that its intention was restrictive in character. It was planned that way, with the thought that if any partner, acting on his own, obtained crude-oil production within the red-line area that his original interest in Iraq Petroleum Co. as a whole might subside. Moreover, with possible outside interests (such as Jersey Standard and Socony-Vacuum would have on consummation of the Arabian American deal), it was felt that an Iraq Petroleum partner "playing it on his own" might order his two board directors (in the case of each of the four major interests) to bottleneck plans beneficial to other interests of the company.

It is an open secret that the four partners, representing four countries, have often failed to agree on overall plans, and current French protests are the second test of the legality of the "Red Line Agreement." The first was in 1927—a year before the agreement was reaffirmed—when a British company unrelated to Iraq Petroleum, offered Gulf Oil Corp., then a participant in Iraq Petroleum, an option on its concession on Bahrein Island. But as Gulf was bound by the agreement it passed the option on to California Standard.

However, the postwar status of the "Red Line Agreement" is more than a mere legal question, according to one well-informed source, who stated that "its long-range implications involve a certain spirit as well as letter of the law." And it is this certain spirit which Cie. Francaise is banking on heavily as being the British court's interpretation. On the strictly legal side, the two American companies contend that the agreement was invalidated by the British trading-with-the-enemy act when Germany occupied France.

Jersey Standard stated that "the American group has advised all participants of a willingness to enter into a new agreement concerning the Iraq Petroleum Co., as long as it does not contain any restrictions of free competition."

No "Adverse Effect"

Socony-Vacuum, commenting on the legal action being taken by Cie. Francaise, stated that it "has always desired to negotiate a new agreement similar in terms to the old except for the restrictions which it knows to be objectionable to the U. S. Government as well as to itself."

Furthermore, Socony-Vacuum revealed that "last October the company sent an emissary (Board Chairman H. F. Sheets) abroad who made its position clear to the French and other Iraq Petroleum Co. groups. All

the groups (in Iraq Petroleum) were told at that time that Socony-Vacuum was considering purchasing an interest" in Arabian American.

It was also emphasized by Socony-Vacuum that the current negotiations with Arabian American "can have no adverse effect on the operation and development of Iraq Petroleum Co." The American partners have always urged the expansion of I.P.C., Socony-Vacuum said, concluding: "While the French position is not entirely clear to us, it is hard to understand their objection to something which, though unquestionably beneficial to the United States, can have no harmful effect on them."

Little has been said about the European refinery expansion plans of Jersey Standard and Socony-Vacuum in the projected negotiations to increase Middle East crude oil requirements. Russia's continued refusal to cooperate with the Allies in the Central European countires, by failing to observe wartime agreements, has hamstrung oil company operations there.

There is little doubt but what the concurrent crude-oil purchase negotiations with Anglo-Iranian on the part of Jersey Standard and Socony-Vacuum also act as an irritant insofar as Cie. Francaise is concerned, though there is nothing in the contract that prohibits this type of deal—whether the "Red Line Agreement" is in effect or not. Then there is the factor that Cie. Francaise is in the same position as the two American companies, in that more crude is needed for its postwar operations. Another irritant may be the fact that Shell is lifting 20,000 bbl. daily from Kuwait, though this is a straight purchase agreement, and Cie. Francaise has equal privileges in such matters. It all boils down to a keen postwar competition for European and African markets, with no company wishing to see a competitor get too much of a jump on the vast sales potential.

Elsewhere, however, plans are going ahead, mostly to rebuild and expand existing refineries. When and where new refineries will be built is not definitely known here in New York. But the companies concerned readily admit that the construction of new European refineries is a distinct possibility.

In England, Jersey Standard has plans under way to expand its 12,000-bbl. daily refinery at Fawley to approximately 69,000 bbl. daily. At Port Jerome, France, Jersey Standard's prewar 25,000-bbl. daily refinery is currently running around 12,000 bbl.,

(Continued on page 122)

WASHINGTON WATCHING

BY HENRY D. RALPH

World-Trade Dickering

WASHINGTON. — No matter how good a prima facie case against reductions in import taxes on petroleum products the Independent Petroleum Association of America makes at the reciprocal - trade - agreements hearings this week, the arguments are apt to be discounted by the Committee for Reciprocity Information and the negotiating teams which will meet with the other nations in Geneva later in the spring.

In the first place, more than 1,000 briefs have been filed, and some 600 or 800 witnesses are presenting oral arguments, and most of these will contend that their own particular industries need more rather than less tariff protection in this postwar period. The majority will endorse the idea of expanding world trade but will ask that it be done at the expense of somebody else. After several weeks of listening to such pleas regarding virtually every commodity listed for negotiation, the committee's natural reaction will be to discount them all rather liberally.

In the second place, the administration is convinced that the United States must act now or never if it is to free world trade of the obstacles that were imposed by most countries before, during, and since the war, and that the only way to induce these nations to remove exchange, quota, and other restrictions is through specific contracts whereby the U. S. makes substantial cuts in its own tariffs.

Promise Due Consideration

While admitting these conditions, the officials in charge insist that they will give due consideration to all presentations regarding specific commodities and that they will not surrender any tariff protection which is really essential to domestic prosperity. Also, they insist they are not going to give away any of this protection in a spirit of international altruism, but will drive hard bargains and get equivalent concessions for each one of our own.

The mere fact that one of the negotiating countries has asked for a duty cut on a particular commodity and this commodity has been listed for hearing does not mean that a cut will be made, and it will not be if domestic industries can produce good arguments or if the other country fails to offer enough in return. The officials believe that if duty reductions are made more or less throughout the entire tariff schedule, no one industry can claim unfair treatment and that all will benefit, directly or indirectly, by the resulting increase in commerce throughout the world.

However, the recent elections and the current temper of Congress have imposed a measure of restraint on the negotiators. The tariff is still the sharpest partisan issue, and the new Republican majority is quite critical of the reciprocal-trade idea. There is a growing threat in Congress to junk the whole proceedings, but it is not expected to materialize into positive action. But this opposition will make the negotiators more wary and force them to drive harder bargains.

The Tidelands Problem

THE tidelands oil problem is again before Congress in exactly the same form as the resolution vetoed by President Truman last year, notwithstanding the prospect that the Supreme Court will decide the legal aspects of the case this spring.

In the Senate a resolution to quiet the titles of the respective states and their grantees to lands beneath tidewater and navigable waters has been introduced jointly by Senators Moore of Oklahoma, Knowland of California, and McCarran of Nevada (S. J. Res. 14). Similar resolutions were introduced in the House by Representative Hebert of Louisiana (H. J. Res. 51) and Representative Hinshaw of California (H. J. Res. 52).

While the Supreme Court set argument for February on the federal Government's suit to obtain title to California's off-shore oil resources, the Department of Justice has not yet filed its brief and the state doubtless will want 60 days to study it before argument. This indicates that a decision may not be had until late in the spring. Thus Congress should have ample time to act on the resolutions before the court's decision, though opponents will insist it would be rude for Congress to do anything while the case is still pending.

The New U. S. Budget

GOVERNMENT functions relating to natural resources will require $1,101,000,000 of the total budget of $37,500,000,000 for the fiscal year 1948 submitted to Congress last week, according to a breakdown of expenditures by functions given by President Truman for the first time.

Other major allocations are (in billions): national defense, $11.2; international affairs and finance, $3.5; veterans, $7.3; social welfare, $7.6; agriculture, $1.3; transportation and communication, $1.5; and others.

However, under natural resources not primarily agricultural, the President includes such items as $443,000,000 for atomic-energy research, $225,000,000 for river and harbor work, $176,000,000 for reclamation, $94,000,000 for TVA and other electric projects; $56,000,000 for forestry, and only $27,000,000 for mineral resources, of which $4,000,000 is for Naval petroleum reserves in Alaska and elsewhere.

The President asked that no taxes be reduced and counted on a slight increase in business activity to yield revenues totaling $37,700,000,000. He counts on the federal gasoline tax to yield $486,000,000 in fiscal 1948 compared with $440,000,000 during the current fiscal year and $405,694,551 actually collected in fiscal 1946. Similarly, the lubricating-oil tax is figured at $89,000,000 in 1947-48 against $81,500,000 in 1946-47 and $74,601,713 in 1945-46, and the tax on transportation of oil by pipe line at $15,900,000 in 1947-48 as against $15,500,000 in 1946-47 and $14,823,532 in 1945-46.

Accumulating Strategic Stockpile

In discussing Interior Department expenditures, the President said: "Our mineral resources have been seriously depleted during the war. Substitutes or new sources of supply must now be found. As part of our military program we are accumulating a strategic stockpile of critical materials from both domestic and foreign sources. To plan this program successfully and to assure adequate supplies for industrial and consumer use, it is essential that we have full information on our domestic resources. Consequently, the Bureau of Mines and the Geological Survey will make small expansions in their mineral-resource programs in 1948.

"General surveys and topographical-mapping activities by the Geological Survey must be accelerated to provide basic data needed for natural-resources programs and industrial development."

For the Interior Department as a whole the budget allocates $314,281,220, which is $35,469,253 more than it is expected to spend during the current fiscal year.

The Oil and Gas Division, which is shown as an integral part of the office of the secretary, is given $463,-

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900, as compared with $400,000 for the current year.

The Bureau of Land Management gets $5,007,800, which is $685,284 more than appropriated this year for the activities of its predecessor, Grazing Service and General Land Office, but most of the increase will go to range-management work.

The Geological Survey is given $18,104,900, an increase of $8,243,228, the bulk of the new funds to go for geologic surveys and topographic mapping.

The Bureau of Mines is given $16,834,000 compared with $16,164,815 for the current year.

The detailed figures give little explanation of how the funds are to be used, since the breakdown is chiefly by statutory authorizations. The Bureau of Mines is to get $5,000,000, to continue synthetic-fuel research, compared with $5,250,000 this year. For its oil and gas investigations it gets $906,500 compared with $826,750 this year, with the increase spread rather evenly among research on primary extraction, secondary recovery, the Bartlesville experimental station, and other projects. The bureau's petroleum economics section gets $91,050, compared with $61,410 for the current year.

The L.P.G. Tank-Car Muddle

EVERY distributor of liquefied petroleum gas who depends on tank-car deliveries is short of supplies at present, and at least 87,000 private homes and many industrial and commercial consumers have been out of gas for varying periods during the past 2 weeks, Howard D. White, vice president of the Liquefied Petroleum Gas Association, declared in a telegram last week to the Office of Temporary Controls.

White declared this situation will become progressively worse during the winter unless OTC changes its policy of giving the Army's fertilizer program priority over L.P.G. service in obtaining pressure tank cars.

After sending this telegram White spent several days in Washington talking with OTC officials without getting any encouragement whatever. He was given the distinct understanding that absolutely no change will be made in the fertilizer program and that L.P.G. customers will just have to go without fuel until new cars can be built some time in the future. Apparently the only hope for a change in this policy is for enough fuelless customers to complain to their congressmen with sufficient vehemence to stir up action on Capitol Hill.

Meanwhile OTC is trying to ease the situation by exploring means of allocating L.P.G. among customers, and interdepartmental conferences on this subject are now in progress. The idea seems to be that farms and homes could be supplied with available L.P.G. cars if gas were denied to commercial and industrial users during the winter, but the explorations are already running into the fact that L.P.G. is widely used in heat-treating steel and other industrial processes vital to the whole reconversion program. It would be ironic if the fertilizer program resulted in preventing the manufacture of agricultural machinery designed to make use of this same fertilizer.

NPC Terms Extended

ALL members of the National Petroleum Council who were appointed by Secretary Krug last summer for a term of 1 year are having their appointments extended to the end of 1947.

Since meetings are held quarterly, the members have had two meetings and have not yet completed their permanent organization, and it was pointed out that if officers are elected at the January 21 meeting they will have only one more session before going out of office. Also it was felt desirable to have the terms run by calendar rather than fiscal years. Ex officio members, of course, remain on the council for such periods as coincide with their terms of office in the trade associations which they represent.

It is a safe bet that the membership will insist that Walter S. Hallanan, of Plymouth Oil Co., take the post of permanent chairman of the council for 1947, not only because he has been temporary chairman so far but because he is now expected to have a little influence in certain quarters through his position as Republican state chairman for West Virginia.

Synthetic-Rubber Plans

CONGRESS will be asked by the administration to take quick action on an interim rubber-control plan pending drafting of a permanent program for preserving a synthetic industry.

In the meantime the Government will continue to be the sole purchaser and importer of foreign crude rubber until expiration of the War Powers Act March 31. This decision was made by the White House over the opposition of rubber importers and manufacturers who fear that government purchases will not result in as large imports as private purchasing would now that the exporting areas have removed their controls. The administration view is that private traders will not be able to set purchasing programs until Congress has indicated what legislation it may enact. The proposed interim legislation will continue government controls over the end use of natural and synthetic rubbers at least until there is an ample supply of both, and permanent legislation will be designed to insure a market for at least 250,000 tons of synthetic per year.

The budget for the Reconstruction Finance Corp. assumes that government-owned plants will produce 508,000 tons of synthetic rubbers of all types during the fiscal year ending June 30, 1948. It contemplates that during the current fiscal year it will close down and declare surplus 17 of the 51 plants of all types in the rubber program, and that during fiscal 1948 it will declare three more surplus and put into stand-by condition three others costing $49,000,000. The plants kept in operation will have their efficiency increased by the addition of $12,000,000 of new equipment.

The 508,000 tons of all types of synthetics to be made next year will be made by 28 plants and have an average production cost, including depreciation, of 18.37 cents per pound and will be sold at an average of 19.13 cents per pound, assuming no change in current price schedules.

Federal-Tax Forum Set Next Week in Shreveport

A review of developments in federal-tax matters during the past year and a discussion of current federal-tax problems will highlight the annual federal-tax forum of the Mid-Continent Oil and Gas Association, to be held in the Washington-Youree hotel in Shreveport January 23-25.

T. H. Marshall, Anderson-Prichard Oil Corp., Oklahoma City, chairman of the forum, said nationally known tax experts will appear throughout the series of sessions.

Porter, Mapes Reelected

Directors of the Mid-Continent Oil and Gas Association meeting January 13 in Tulsa reelected F. M. Porter, Fain-Porter Drilling Co., Oklahoma City, president, and Clarel B. Mapes, Tulsa, general secretary-treasurer. Jake L. Hamon, Dallas, was named first vice president. Other vice presidents selected were: E. F. Bullard, Tulsa, for Oklahoma; H. E. Zoller, Wichita, for Kansas; C. E. Simons, Dallas, for Texas; A. H. Weyland, Shreveport, for Louisiana and Arkansas; W. M. Vaughey, Jackson, for Mississippi and Alabama; and Van S. Welch, Artesia, for New Mexico.

Butane Plant to Close

TOLEDO.—An order has been issued by the Renconstruction Finance Corp. to shut down the butadiene plant at the Sun Oil Co. refinery on Woodville Road, East Toledo. Two hundred employes will be laid off.

Market Circles Talk Crude Hike; Products Movement Active

EXPECTATIONS of another crude-oil price advance have given additional strength to the petroleum industry's generally active mid-winter products market.

Speculation over a crude advance was touched off by the action of Premier Oil Refining Co. in posting a 10-cent raise for East Texas crude effective January 10. Crude-purchasing officials were watching the situation closely early this week, though no other companies had met the raise.

Premier's raise caught many company officials by surprise. A general advance had been generally anticipated in March or April in advance of the heavy gasoline-consuming season. Some more conservative market observers still contended major companies will be reluctant to spread the advance.

Premier, which buys up to 5,000 bbl. daily in East Texas, posted a flat $1.80 per barrel price for oil from the field. The highly sought-after sweet East Texas crude has been commanding premiums, paid in various forms, from some buyers. Last November's nation-wide crude advance did little toward making more crude available, in the opinion of purchasing officials.

Though markets were strong in the interior, the East Coast burning-oil trade suffered from warm weather. Socony-Vacuum Oil Co., Inc., in New York dropped barge-load lot prices of No. 2 from 6.3 to 6.15 cents. East Coast stocks were described as heavy. Residual fuel oil was reported still tight in New York with a price advance expected shortly.

Mid-Continent and Midwest

In the Mid-Continent and Midwest, conditions generally favored a rising market and products were moving at full posted prices. The single possible exception was some spot-market tank-car motor fuel. Even this material appeared to be showing less seasonal weakness than usual.

Pipe-line gasoline was described as in heavy demand. Major companies continued to store all quantities possible against anticipated unprecedented summer demand and in some cases were buying tank-car motor fuel from smaller refiners for shipment to points remote from pipe-line terminals.

The burning-oil market continued extremely strong in the Mid-Continent, although sales officials were less optimistic than previously about the possibility of another general price increase for this group of products. No. 2 was quoted at 4⅞ to 5 cents, and 42-44 kerosene at 5¾ to 5⅞ cents.

In the Mid-Continent area, natural gasoline was steady at 5 cents, Group 3. The North Texas quotation remained at 4½ cents. One marketing official reported export demand for natural is extremely strong and said it is unlikely this market will show the same violent dip downward this spring that was characteristic of prewar years.

Oil and Gas Committee Adopts Report, Dissolves

DALLAS.—The National Oil and Gas Committee was dissolved here Monday after adopting a report of its legal subcommittee regarding amendments to the federal Natural Gas Act.

The report recommended that the act be so amended as to make it clear and definite that the act will not apply to producers and gatherers of natural gas or to the sale of natural gas by them to interstate pipe lines.

It further recommended that the Federal Power Commission be given no jurisdiction or authority to determine or control the use for which natural gas may be sold. It would limit jurisdiction of federal regulation under the act primarily to interstate trunk-line transportation of gas and to the sale of gas for resale for public consumption, as was intended, the report said, by Congress when it adopted the act in 1938.

Committee members said the organization, appointed recently as an industry advisory committee, had completed its function in making its study and formulating a report and therefore was dissolved.

More Portal Pay Suits Filed Against Oil Firms

While congressional leaders last week considered legislation eliminating or restricting portal-to-portal pay suits aggregating more than $4,000,000,000, additional suits totaling many millions were filed against petroleum-industry companies.

Heading the list in the oil industry was a $10,000,000 suit against Standard Oil Co. of New Jersey, filed by the Independent Petroleum Workers of New Jersey on behalf of an unspecified number of employes.

In Houston, Humble Oil & Refining Co. was the target of a $6,000,000 suit by 2,648 members of the Baytown Employes Federation, an independent union of Humble workers. Suits of unspecified amounts were filed there against Houston Pipe Line Co., American Liberty Oil Co., and two Alice, Tex., rig-building concerns, Nelms, Tolson & Meyer, and McGuffin, Carpenter & Yarbrough.

At Beaumont, Tex., Gulf Refining Co. was sued for $3,000,000 by two locals of the Oil Workers International Union. Number of employes seeking the back pay was not specified.

Index Ready Soon

The complete editorial index of The Oil and Gas Journal for 1946 is now in preparation and will soon be ready. Due to the continued shortage of paper, it will not be published in a regular issue. The complete index, enlarged and improved and with more cross-references, bound separately, will be sent without charge to all subscribers requesting a copy. Address requests to Circulation Department, P.O. Box 1260, Tulsa.

DEATHS

H. Vane Brown, former auditor of the old Pierce Oil Corp. refinery at Sand Springs, Okla., died January 6 at his home in Tulsa.

George H. Ulmer, 44, engineer with Standard Oil Co. of Kentucky, died recently in a Hattiesburg, Miss., hospital.

Anthony C. Quast, 53, consulting petroleum engineer and formerly an engineer with several producing and refining firms, died January 7 in a Tulsa hospital.

Fay Hulsey, 51, production superintendent of Traders Oil Corp., died January 2 in a Humble, Tex., hospital.

Verne H. Van Horn, 54, manager of the trusts-operating division of Southwest Co., independent oil operators, died January 7 at his home in Tulsa.

Joseph Owen, 94, early-day East Coast oil operator, died January 8 at his home in Richburn, N. Y.

Electronic Detonation Indicator

Development work for laboratory and full-scale evaluation of aviation fuels

by D. R. deBoisblanc, H. M. Trimble, and Leo A. McReynolds

IN recent years the actual measurement of detonation characteristics of fuels in flight has been undertaken. It therefore has become desirable to develop electronic detonation detecting equipment which would enable a more precise evaluation of this characteristic. This paper presents a description of three instruments which have been developed for determining the detonation behavior of fuels in full-scale and laboratory engines. Data are presented which show that a significant improvement in reproducibility of ratings is obtained when using the electronic detonation detecting instruments described as compared to ratings obtained by means of audibility techniques.

1. Introduction

THE performance of fuels in aircraft engines may be restricted by their detonation or knocking tendencies. For this reason much work has been done toward development of methods of describing the fuels in terms of these knocking characteristics. These efforts have been mainly directed along two paths—first, attempts have been made to examine the fundamental nature of the physical and chemical phenomena involved in the combustion process, and second, methods have been worked out for detecting the presence and extent of detonation without specific concern with its cause. The latter methods have all made use of some effect or combination of effects which are always associated with detonation in combustion chambers.

A few of the "byproducts" of detonation which may be conveniently measured are temperature rise, chemical or physical changes in exhaust products and acoustical effects. The latter effects are so positive and so easily measured that most of the methods of rating aviation type fuels have been built around some form of acoustical detector. In several of these methods, the human ear has been used with surprising success to estimate the degree or "intensity" of knock. Unfortunately, variations in ability to detect a given intensity of sound exists among various ears; also the human ear tends to fatigue or to be affected by physical conditions, hence, a given individual may have a tendency to assign different values to a given sound intensity; in addition these aural rating procedures require operators trained over such a long period of time that the replacement problem is very difficult. Hence, for the last few years electronic instrumentation has begun to assume a position of increasing importance in fuel rating. It seems reasonable to assume that ultimately all fuel rating will depend to some extent on some type of electronic instrument.

In 1941, recognizing this trend, Phillips Petroleum Co. began the development of electronic instrumentation for the detonation rating of aviation fuels in the laboratory. Attention was directed also to development of an instrument to be used as part of the flight-test equipment then being installed in one of the company air planes. The purpose of this paper is to describe the instruments which have resulted from this work and to present some of the test data obtained. The flight test data presented were secured under contract to the Army Air Forces and are reproduced through their courtesy.

2. General Discussion

In an engine operating normally without detonation, the combustion process proceeds at such a rate that the pressure changes in the cylinder may be followed smoothly by the piston and the entire moving assembly. Under certain engine conditions, however, the unburned gases remaining in the cylinder near the end of the combustion interval reach such conditions of temperature and pressure that the entire remaining charge spontaneously explodes. The exact mechanism operating to cause this sudden change in the rate of travel of the flame front is not completely understood, but the resultant disturbance has been verified many times. The sudden local pressure differences which are created by this explosion

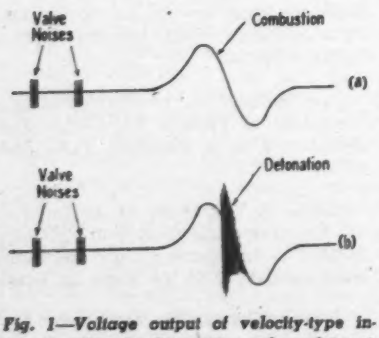


Fig. 1—Voltage output of velocity-type internal pickup for detonating and nondetonating conditions

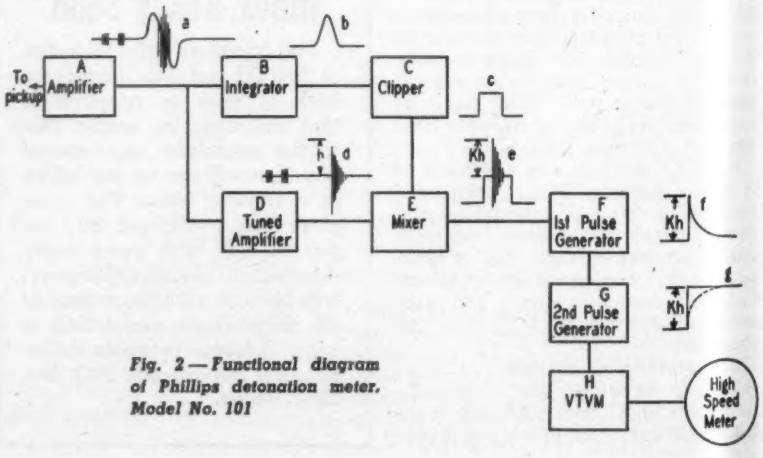


Fig. 2—Functional diagram of Phillips detonation meter, Model No. 101

are propagated in the form of waves through the gases of the chamber at velocities equal to or greater than those of sound waves. These waves are reflected back and forth many times by the cylinder walls and piston face until their energy is dissipated through absorption in the gas and transmission into the cylinder walls. Apart from heating effects the net result of this multiple reflection is to set up various types of oscillation in the engine system. Just what frequencies of oscillation will be favored and to what extent is determined by what are known as the normal modes of the system. A complicated structure like an engine has many normal modes of oscillation. It is for this reason that a detector placed in the system will show a heterogeneous mixture of damped sinusoidal oscillations of different frequencies, corresponding to the normal modes. If the detector happens to be an electromagnetic device in which the actuating element is a diaphragm exposed to the cylinder gases, the pressure fluctuations inside the cylinder are favored. In a properly constructed pickup the voltage output will be a simple function of the pressure in the cylinder. Fig. 1 shows the type of pattern one obtains on a cathrode-ray oscillograph when a detector is inserted through a hole in the cylinder so that the gases may act directly on the diaphragm. Part (a) shows a normal nonknocking cycle, while (b) displays the pattern obtained during a knocking cycle. The high-frequency detonation wavelet shown is composed of a large number of damped sinusoidal oscillations superimposed on each other. This is the type of signal which actuates all of the instruments to be described in this paper.

3. Flight-Test Instrumentation

When thought was first given to using the Lockheed Lodestar from the company's fleet as a flying laboratory to test fuels under actual operating conditions in aircraft engines, it was recognized that some type of instrument to indicate the presence of detonation in the engine would be needed. The use of the ear was automatically ruled out because of flight conditions, so the use of an electronic indicator was considered necessary from the

THE AUTHORS

DE BOISBLANC

H. M. TRIMBLE

LEO McREYNOLDS

Deslonde R. deBoisblanc has been employed in the research department of Phillips Petroleum Co. since 1941, in which year he received his B.S. degree from Louisiana State University. His work has been concerned with special instrumentation such as the detonation-detecting devices described here. He has also served as a consultant physicist on various problems arising in the company.

Harold M. Trimble is senior associate director of research in charge of the engine laboratory division for Phillips. He obtained his B.S. in chemical engineering at Ohio State University in 1923. He was associated with Republic Steel Corp. and Ethyl Gasoline Corp. before joining Phillips. He has been active in the cooperative development of both laboratory and full-scale aviation and motor-fuel knock-test procedures

Leo Allen McReynolds joined Phillips' research department in 1939, and is now senior section chief of the fuel-test division. He received his B.S. in chemical engineering at University of South Dakota. While working for his master's degree he was employed in the South Dakota Chemical Laboratory as assistant state chemist. He received his M.S. in 1939.

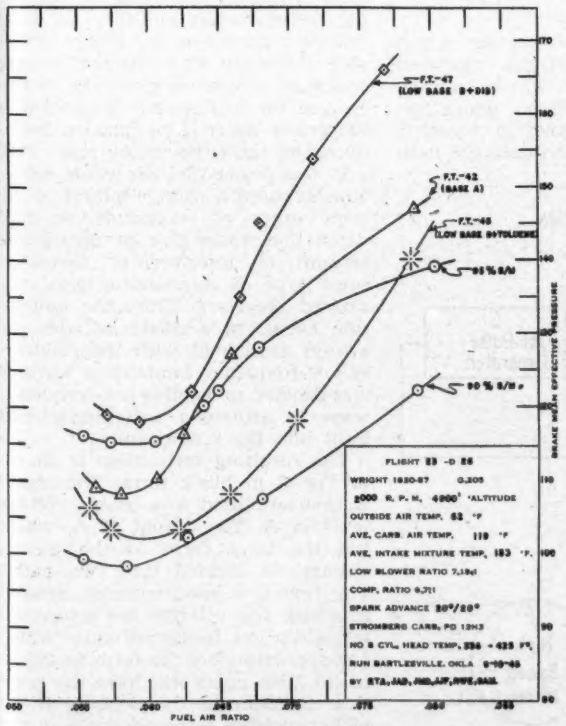


Fig. 3—Trace-knock curves on fuels, flight tests 42, 45, and 47, obtained in flight

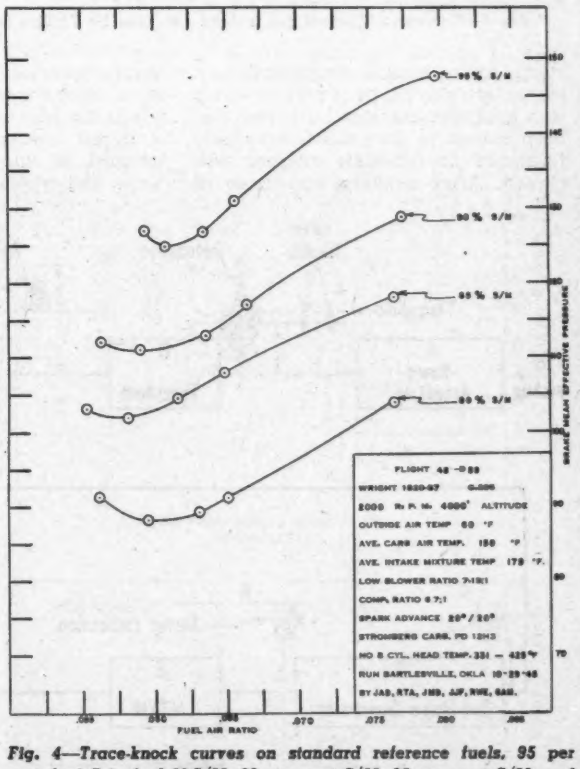


Fig. 4—Trace-knock curves on standard reference fuels, 95 per cent fuel S in fuel M S/M, 90 per cent S/M, 85 per cent S/M, and 80 per cent S/M in flight

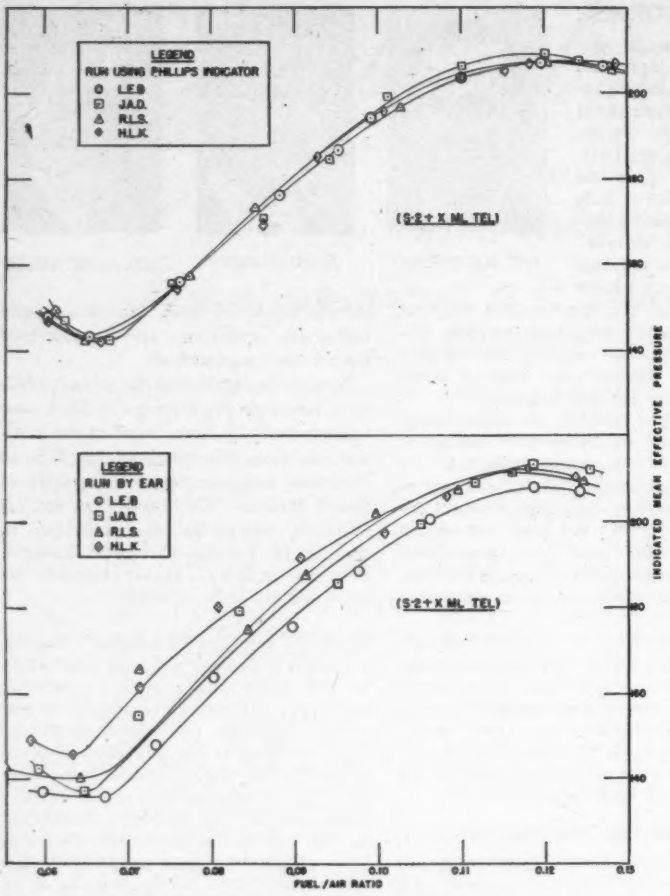


Fig. 5—Trace-knock curves run first by ear, then by Phillips indicator

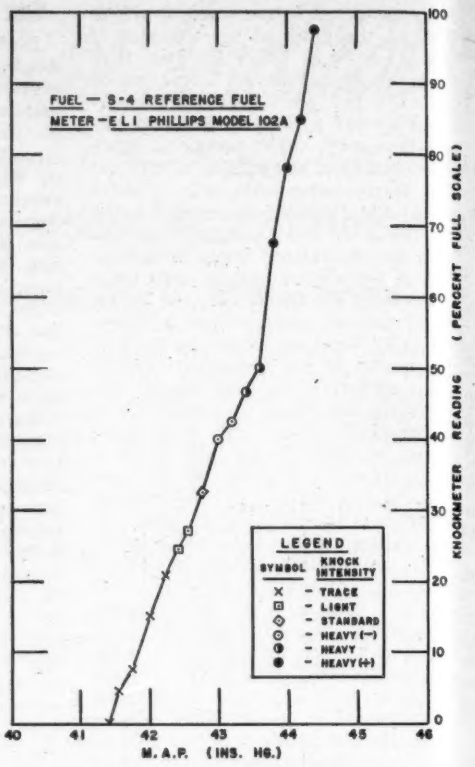


Fig. 7—Sensitivity of knockmeter readings using the ELI-Phillips Model No. 102-A on the F-4 method

start. After careful consideration, a magnetostrictive type of pickup which was available commercially and had been shown to give satisfactory performance in full-scale engines was chosen. After a study was made of the frequencies of detonation which were characteristic of the engine on which the instrument was to be used, a circuit was conceived which responded to the detonation wavelets alone and which quantitatively indicated the magnitude of the maximum rate of change of pressure in each detonating cycle. The use of an almost instantaneous type of measuring device, while contrary to usual practice, proved to be highly desirable since the time interval during which an aircraft engine may be destroyed by very severe detonation is extremely short if preignition is induced by the temperature rise.

It was found that the valve noises which caused a voltage output of the same order of magnitude as mild detonation would give an undesirable amount of interference; therefore, some type of commutator was considered necessary. Since the detonation events in a single cylinder are always associated with the relatively low-frequency combustion wave, it was decided to use this low-frequency wave to actuate a switching circuit built into the instrument.

The resulting instrument is shown in Fig. 2 in block form. The signal is first amplified to a usable voltage level in A. The output of A, which has the same form as the pickup voltage, is divided into two paths. The first is a low-frequency channel in which the voltages are integrated to yield a low frequency pulse which has approximately the form as shown in (b). This pulse will have the same time variation as the pressure if the pickup voltage is proportional to the rate of change of pressure in the cylinder.

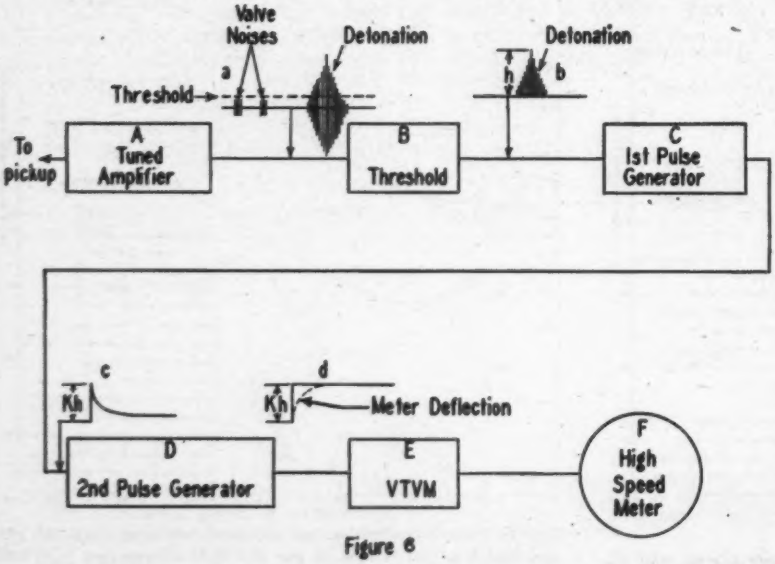


Figure 6

Fig. 6—Functional diagram of ELI-Phillips Detonation meter, Model No. 102-A

This voltage is amplified and clipped to produce a rectangular pulse for each combustion cycle. It is necessary to shape this pulse because of the statistical fluctuations in the amplitudes of the combustion pressure wave from cycle to cycle and also to provide a switching pulse which is independent of the power level at which the engine is being operated.

The second channel fed by A consists of a tuned amplifier D which selects high-frequency components of the detonation wavelet and rejects the low-frequency wave due to the normal combustion pressure variations. The output of this amplifier passes into the mixer, or switch E, which is made operative during the combustion cycle interval by the rectangular pulse output of C. In this manner the valve events are eliminated, since the mixer has no response except when actuated by the pulse from C. The output voltage of the mixer which is as shown at (e) is converted into an exponential pulse whose height is proportional to (h), the peak amplitude of the detonation wavelet shown at (d). The pulse (f) is modified by the second pulse generator G to give a sustained pulse (g) also proportional to (h). The duration of this pulse is sufficiently great to permit the high-speed internally damped meter to rise as indicated by the dotted curve to the peak value of (g). Thus the intensity of detonation in each knocking cycle is measured and indicated separately by the meter hand.

4. Operational Use of Detonation Meter in Flight-Test Work

The installation in the flight-test laboratory included means for the measurement of engine speed, fuel consumption, air consumption, and the other quantities which were called for by the test procedure. A pickup was installed in each cylinder of the engine, and a rotary step switch connected each pickup to the detonation meter for one second intervals. The pickups were installed in sets which were matched on the basis of frequency response and voltage output.

With the engine operating at constant speed, the power output was varied in increments and the fuel flow was adjusted until the detonation meter gave a predetermined deflection. When points obtained in this manner were plotted using quantities proportional to power output as ordinates and fuel-air ratios as abscissae, the curves connecting these points were called "detonation limited performance curves." Fuels were rated by bracketing the performance curves of the unknown fuels with performance curves obtained using standard reference fuel blends. Ratings were then calculated by linear interpolation between the reference fuel values at a given fuel-air ratio.

This flight-testing technique was used in a program conducted by Phillips Petroleum Co. from December 1, 1942, to March 13, 1943. On August 28, 1943, arrangements were made to conduct further tests under contract with the Army Air Forces. The testing technique described previously was used in these subsequent tests. Fig. 3 is a typical set of performance curves taken in normal rating during the course of the Army Air Forces work. In order to facilitate the selection of the bracketing reference fuels, a framework of standard reference fuels was developed and plotted as in Fig. 4. By the use of this chart the operator was able quickly to tell approximately what the fuel being tested was going to rate once its performance curve had been obtained.

The data represented by the curves of Figs. 3 and 4 are quite typical of trace detonation curves obtained during rather extensive flight-test work. An examination of the individual data points indicates that they line up quite well on logical curves and that good reproducibility had been obtained in measuring the detonation characteristics of fuels in flight.

5. Laboratory Instrumentation

Since the cost of operation of full-

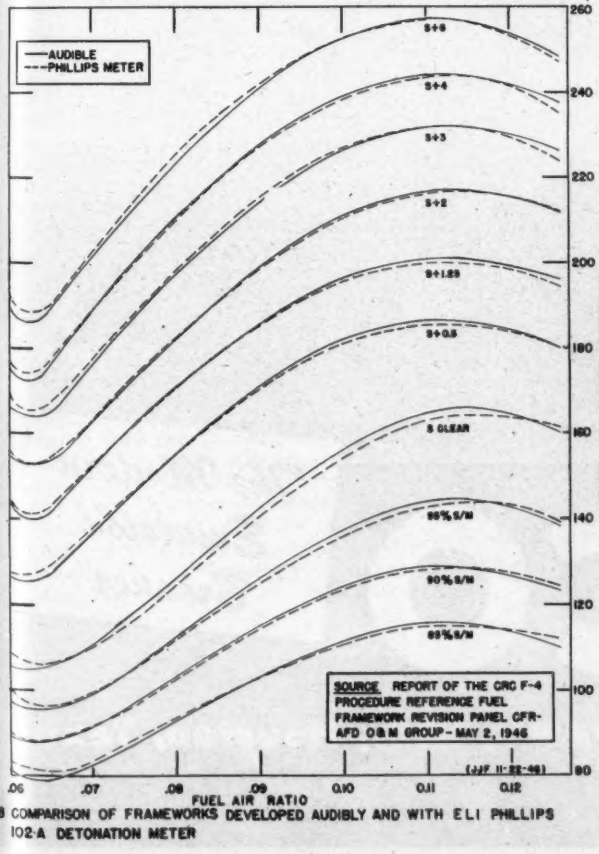
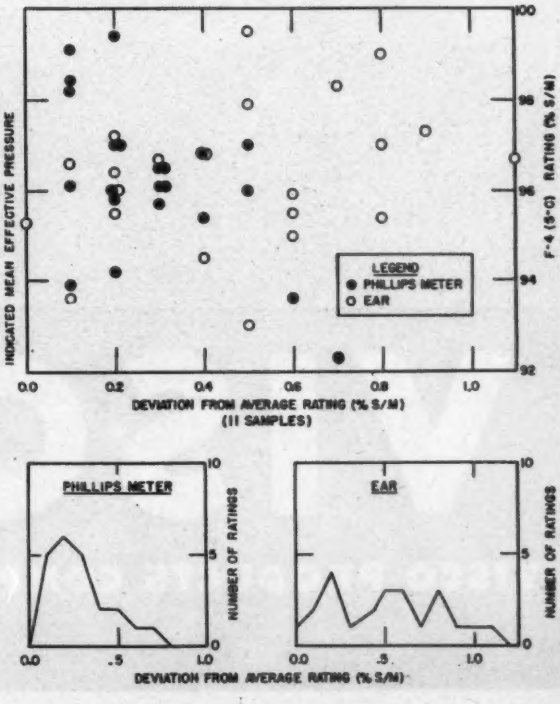
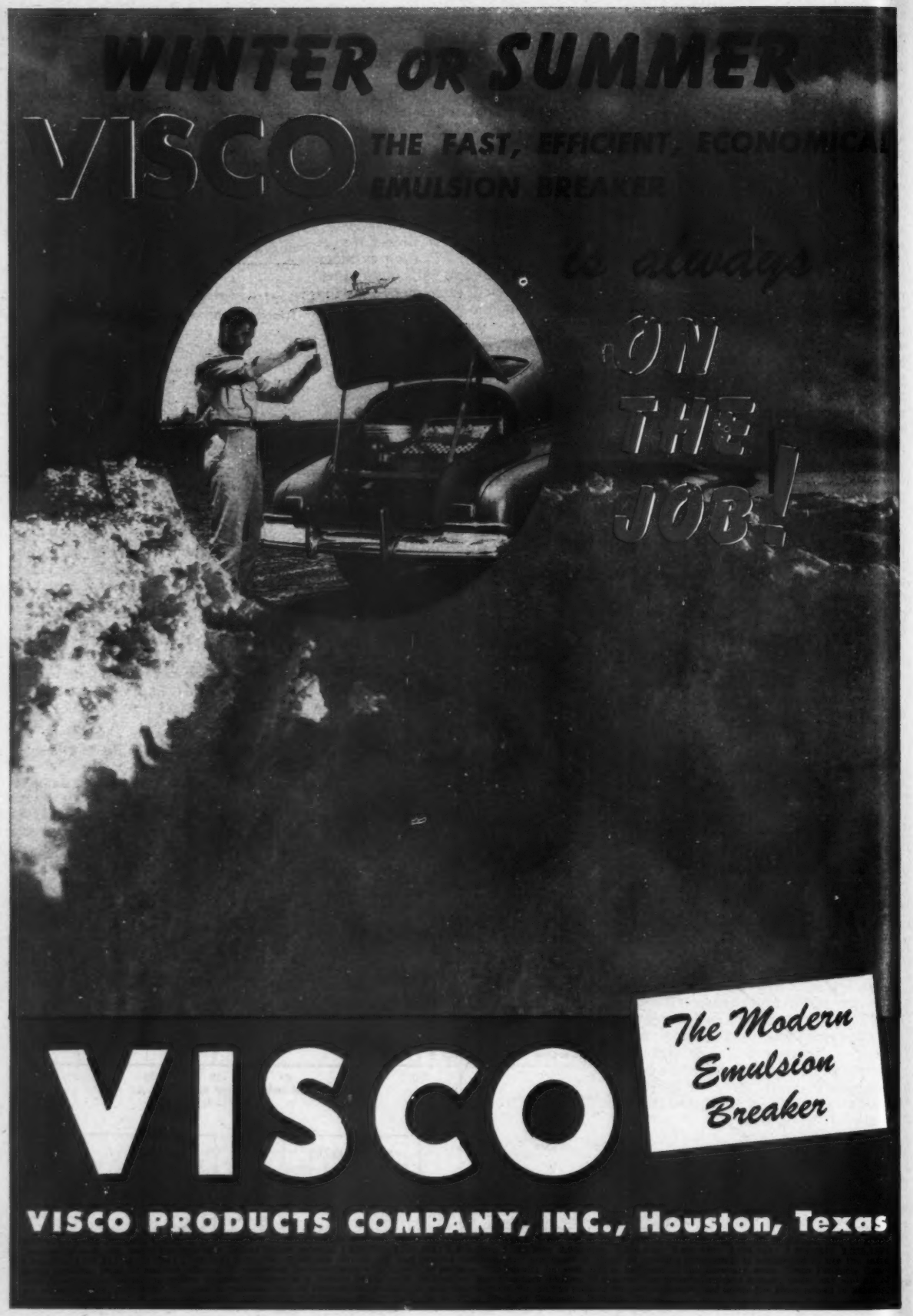


Fig. 8—COMPARISON OF FRAMEWORKS DEVELOPED AUDIBLY AND WITH ELI PHILLIPS 102-A DETONATION METER

Fig. 8—(Left) Comparison of frameworks developed audibly and with ELI-Phillips Model No. 102-A detonator meter

Fig. 9—Comparison of rating reproducibility obtained by ear and with Phillips detonation meter on the F-4 (3-C) engine

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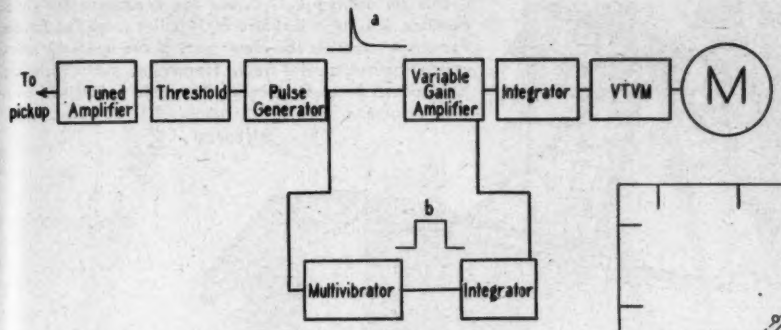


Fig. 10—Functional diagram of Phillips detonation meter

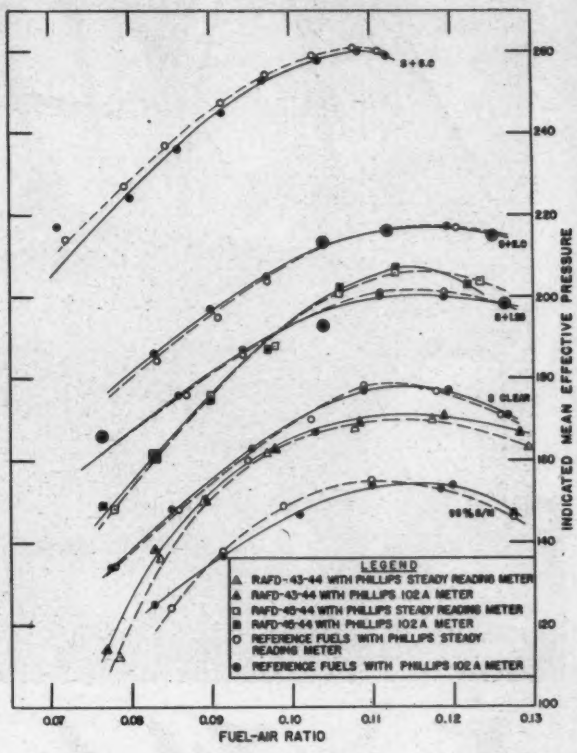

INDICATED MEAN EFFECTIVE PRESSURE
FUEL-AIR RATIO
LEGEND
RAFD-43-44 WITH PHILLIPS STEADY READING METER
RAFD-43-44 WITH PHILLIPS 102A METER
RAFD-45-44 WITH PHILLIPS STEADY READING METER
RAFD-45-44 WITH PHILLIPS 102A METER
REFERENCE FUELS WITH PHILLIPS STEADY READING METER
REFERENCE FUELS WITH PHILLIPS 102A METER

Fig. 11—(Below) Comparison of standard F-4 performance curves with those obtained using Phillips steady reading meter

scale engines is so great, most fuel ratings in the petroleum laboratories have been done on single-cylinder engines of relatively simple design. One such laboratory method in common use is the C.R.C. F-4 supercharged procedure. In this method, which was previously known as the 3-C procedure, somewhat the same type of detonation limited performance curves are obtained as those described previously. Ratings are made in the same manner, that is, by linear interpolation between bracketing reference fuel blends. In the 3-C method, curves were plotted over a fuel-air ratio range from about 0.06 to 0.12. In the 3-C method the detonation intensity was originally measured using the human ear. More recently, electronic instruments have been developed which are used in place of or as an adjunct to the human ear. One such instrument which has been approved for use on the F-4 (or 3-C) procedure was a modification of the instrument used in the flight-test work.

The modified form of the instrument used in the flight test work was put into service on laboratory 3-C engines in the various antiknock test laboratories in the company starting in September 1942. An improvement in the reproducibility of the laboratory ratings resulted immediately. This was verified by a simple test involving four experienced aural operators. Each of these operators rated an unknown fuel first by ear and then using the Phillips detonation meter. In order to make the test as valid as possible, only one operator was allowed in the engine room at one time. This operator made all the engine adjustments that he felt were required to produce the proper knock conditions. All necessary readings were recorded by an assistant operator who did not permit the operator to see the curves until all the tests were completed. The tests were all run during one 8-hour period on a standard engine in good condition. The performance curves for the unknown fuel are shown in Fig. 5. The dramatic reduction in the scatter of points was a good argument for the use of the instrument.

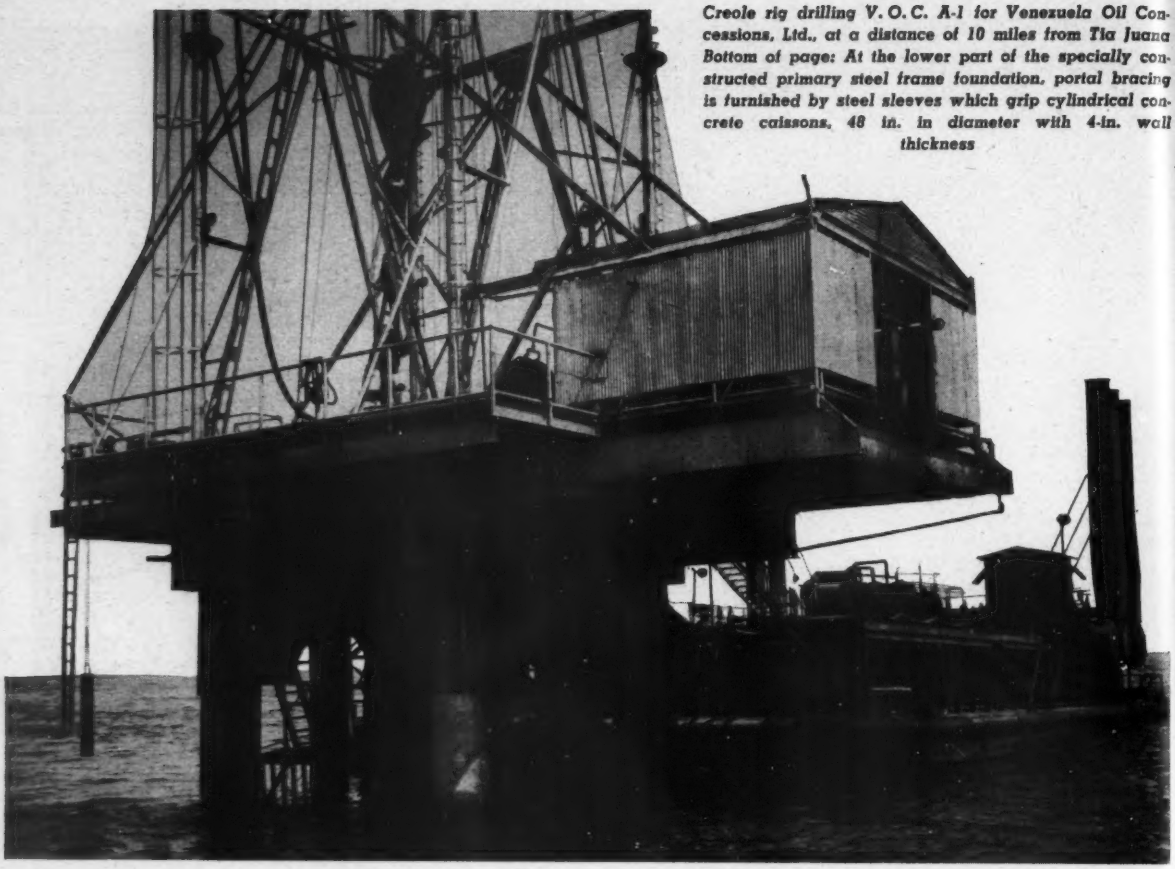
As there was some opposition to the instrument because of the complexity of the circuits, a simpler design was sought which would give comparable results. A study of the signal to noise ratios was made to determine if the switching circuit previously considered indispensable could be eliminated. By the use of a novel threshold circuit it was found possible to accomplish the desired objective.

The resulting instrument shown in functional diagram in Fig. 6 was extremely simple in final form. The tuned amplifier **A** eliminates the low-frequency combustion wave from the pickup signal to give the output represented at **(a)**. The amplifier **B** possesses the property that it passes only voltages which exceed a certain minimum value termed the threshold voltage. This threshold value is made to be just greater than the largest voltage attained by the valve noise as shown by the dotted line in **(a)**. The voltage output of **B** must contain, therefore, only the contribution due to the detonation wavelet, since all other voltages are below this level. The pulse generator **C** produces a pulse of a magnitude proportional to **h**, the peak voltage value attained by the detonation wavelet as it passes over the threshold. From this point on, the signal is converted by **B** and **C** into the sustained pulse **(d)** which actuates the meter. The sensitivity of the instrument is adjusted by varying the amplification of **A**.

Numerous programs were run in the laboratories of other oil companies to test this instrument and it was approved in October 1944 by the aviation fuels division instrumentation group of the Coordinating Fuel Research Committee as an acceptable indicator for the F-4 method. In these programs, tests were made to determine the sensitivity of the instrument to incremental changes in the engine adjustments. In Fig. 7 is shown a plot of data obtained by Phillips of meter readings versus manifold pressure in inches of mercury with the engine operating at constant fuel flow. Here the instrument was adjusted so that the standard knock intensity gave a meter deflection which was 33 per cent full scale. Assuming that one can just tell the difference between a reading of 33 per cent and 40 per cent this yields a maximum point setting error of about ±0.3 in. of mercury, which is greater precision than can be obtained consistently by ear. Actually the meter can be read closer than this after some practice.

Recently a new reference-fuel framework has been developed for the F-4 method by the operation and maintenance group of the Coordinating Fuel Research Committee. Included in this work was a study of the reference-fuel framework characteristics obtained when using the ELI-Phillips Model 102-A meter. Performance-curve data on the standard reference fuel blends were obtained from various laboratories hav-

(Continued on page 76)



Creole rig drilling V. O. C. A-1 for Venezuela Oil Concessions, Ltd., at a distance of 10 miles from Tia Juana Bottom of page: At the lower part of the specially constructed primary steel frame foundation, portal bracing is furnished by steel sleeves which grip cylindrical concrete caissons, 48 in. in diameter with 4-in. wall thickness

Deep Water DRILLING

On Lake Maracaibo

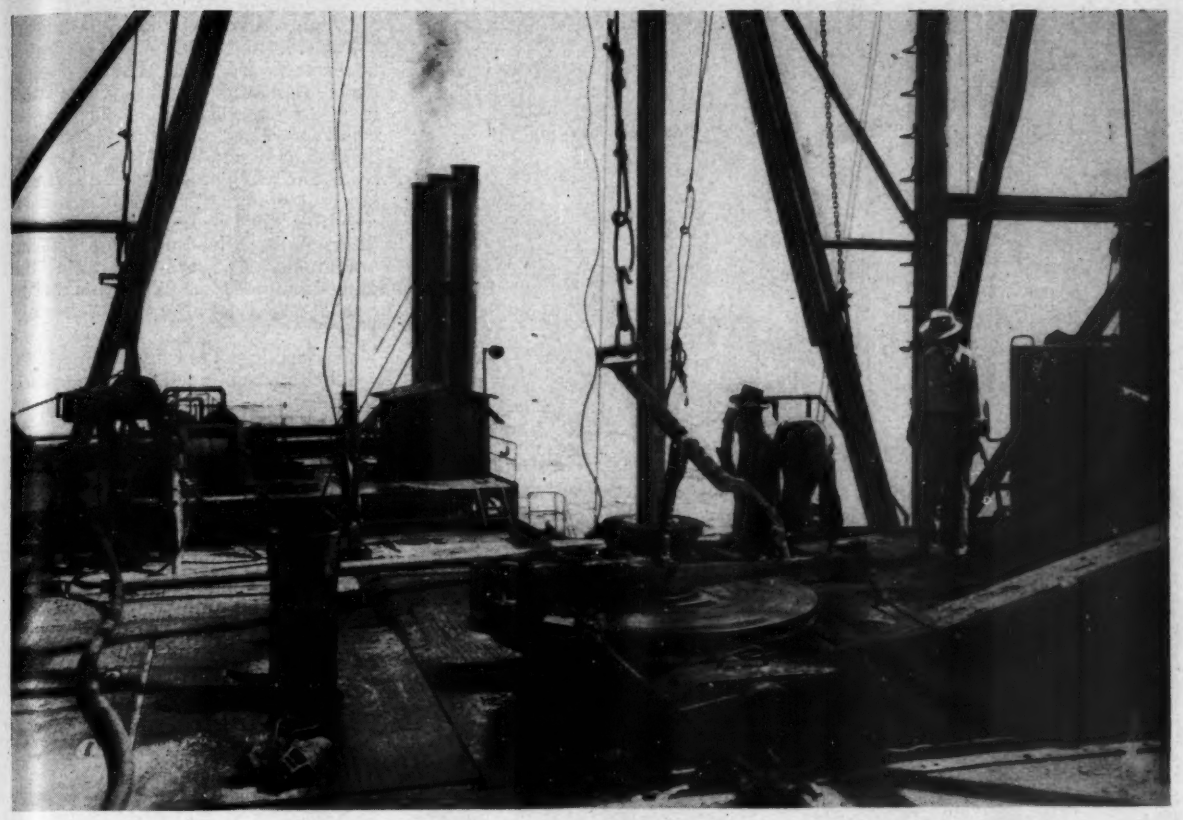
by Paul Reed

FOR long-range drilling operations in all parts of Lake Maracaibo, an extensive program has been developed in recent years by Creole Petroleum Corp. Facilities for such large-scale operations include a substantial shore plant (with its own motor cranes), drilling barges, and special drilling equipment.

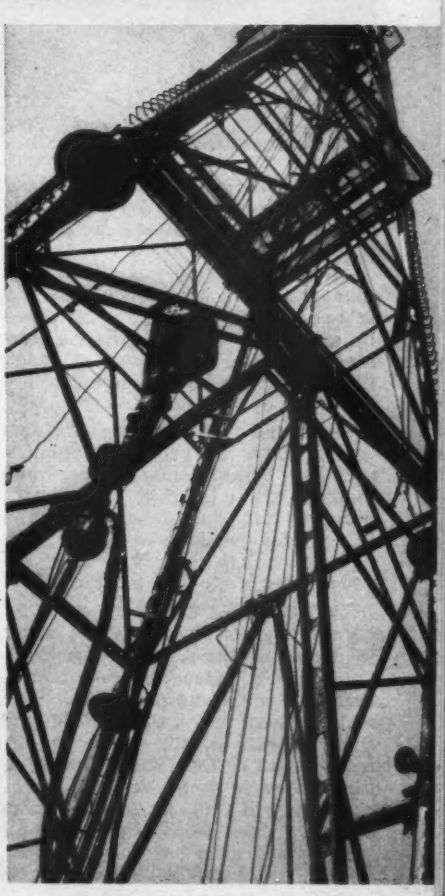
Because of the advanced position achieved in the Lake Maracaibo operations, Creole's methods have established techniques with which the industry must reckon in planning future offshore drilling operations in various parts of the world.

Equipment developed by Creole is capable of drilling anywhere in Lake Maracaibo, even in the deepest water—80 to 90 ft. deep—in the center of the lake opposite Bachaquero.

The company's program aims at



Above: View from derrick floor to drilling barge of Creole deep water rig. Right: All-welded construction features of Creole derrick which is picked up as a unit, including draw works and rotary table, when it is moved by a large barge with a 155-ft. boom from location



uniform development of its lake concessions. In the postwar period plans for exploration have been adjusted, to offset the concentration on exploitation drilling during war years.

Six New Barges

With two new drilling barges the company will have, altogether, six new barges of the largest type as a result of the 1945-46 construction program. These, added to five barges of older types, give a total of 11 drilling barges. Early last year the company had 10 drilling barges, 9 in service and 1 standby. Usually 10½ months' fairly continuous service is had from a barge during the year. About 1½ months are required for scraping the hull, painting, and repairs to equipment.

All of Creole's operations are carried on in the lake where marine craft must be used the way trucks are used on land.

Drilling is frequently interrupted by rough water in the areas out in the lake. During the dry season, the trade wind which starts late in the afternoon and lasts until after dark, stirs up waves that make it necessary to move drilling barges away from the wells during part of each day.

The deep-water drilling visited by the author, through arrangements made by Arthur T. Proudfit, president of Creole, was at V.O.C. A-1 drilled for Venezuela Oil Concessions, Ltd. (Shell) on contract by Creole Petroleum Corp., located in Lake Maracaibo 10 miles westward of Tia Juana, on the Bolivar coast; 12 miles farther west in the lake, Creole was drilling another well for its own account.

Unusual Rig Construction

When approaching the rig used for such a well, one is impressed by the unusual construction of the all-welded 134-ft. pipe derrick. Derrick legs rise perpendicularly to a point approximately 15 ft. above the derrick floor where they slant at an angle to converge at the crown block. In the main frame of the derrick, the draw works and rotary table have been welded into the structure so that the entire assembly may be moved as a single unit. In fact, in moving it is picked up bodily by a large barge with a 155-ft. boom and placed on another barge for shipping to the next location. The caissons of this well are 175 ft. long. The derrick floor is 17 ft. above the surface of the water.

The derrick stands upon a specially constructed primary steel frame

Frame of primary steel frame foundation for a deep-water drilling rig in the foreground at the Creole fabricating and assembly yard at La Salina on the Bolivar coast of Lake Maracaibo. Barge with boom is moving 48-in.-diameter concrete foundation caisson in the rear

foundation which rests on the four caissons; portal bracing is furnished by steel sleeves which grip the caissons. Essential features of Creole's deep-water drilling equipment are protected by patents.

The barge moored next to the derrick contains all drilling equipment such as boilers, mud tanks, mud pumps, etc., according to modern practices for such operations. The design provides for placing the mud pumps so that they will have the advantages of flooded suction.

The research department is studying methods for treating lake water to make it suitable for boiler feed. Calcium and magnesium salts in this brackish water form a hard tube scale. There are variations in the characteristics of the water in different areas of the lake according to the manner in which salt concentrations are affected by tides, and also by fresh water in the rainy seasons.

The practice for such a well, to be drilled to a little below 5,000 ft., is to start with 24-in. protection pipe, set 13⅜ or 16-in. surface pipe and use 9⅝ and 5½-in. for intermediate and oil strings. Annular space between the 24-in. and the surface pipe is filled with cement to protect against corrosion. The current practice is to set pipe to the bottom of the formation and gun perforate.

While hollow cylindrical concrete caissons of 48-in. i.d. with 4-in. wall thickness are generally used by Creole for lake-water depths of more than 60 ft., more easily constructed foundations are used for shallower water. These are built of 16 to 24-in. square concrete piles up to 133 ft. long. Both caissons and piling are fabricated at a yard on shore at La Salinas where special equipment has been installed.

Construction of Caissons

Caissons have grouted joints and are cast of concrete around cylindrical inner shells fabricated from checkered plate with the rough side out. Reinforcing is provided in 3¼-in. spiral steel rods. Caissons are moved about the yard by a Whiting 50-ton traveling gantry crane, supplemented by a 15-ton auxiliary hoist. The 80-ton caissons are not driven into the lake bed but are dead weighted to bearing by a total weight of 200 tons, which is considered sufficient to insure a desirable factor of safety for handling pulling loads during drilling operations. Caissons penetrate the lake bottom 60 to 100 ft. Maximum rise of the tide in the lake is only 1 ft.

Caissons are fabricated in 15-ft. sections, which are later assembled for the length required, the longest being 180 ft.

Square piling is driven into the lake bottom in the same manner as wooden piling. The longest square piling made by Creole is 133 ft.

Formerly caissons were barged from the yard to location. But by sealing both ends, caissons can be floated, thus eliminating the need for the barge and also making it possible to use a tow boat of smaller capacity. Furthermore, loading operations are eliminated by the floating method. Flow stations in the lake are constructed on either piling or caissons.

Exploitation and exploration wells are drilled to depths usually of 3,500 to 6,000 ft.; on the west side of the lake exploration wells are drilled to 7,500-8,500 ft. to Miocene and Eocene formations.

1,200 Wells in Lake

Creole has drilled more than 1,200 wells in Lake Maracaibo. Of these, about 1,100 wells are producing 430,000 bbl. daily; 80 per cent of them are flowing. Less than 10 of the wells drilled were dry holes or submarginal wells when they were completed.

In a program to fill war needs, reservoir-engineering predictions were confirmed by results of a campaign for running seven additional rigs in the lake during which Creole actually increased production 17,000 bbl. per month.

As drilling has gone lakeward there has been more prospecting of Eocene formations. These have been exploited by some dual completions in the Icotea (Eocene) and Lagunillas (Miocene) sands. Eocene has been developed only since 1939.

As development of the great Lagunillas sand has progressed farther into Lake Maracaibo the gravity of the oil has been found to increase in a lakeward direction from 16° at the shore to 25°-26° A.P.I. in a large area in the lake itself. New production far out in the lake has been 27° A.P.I. Creole's lake production comes from approximately 730 Miocene wells and 370 Eocene wells, totaling 1,100 wells. Both Miocene and Eocene formations produce from stratigraphic traps.

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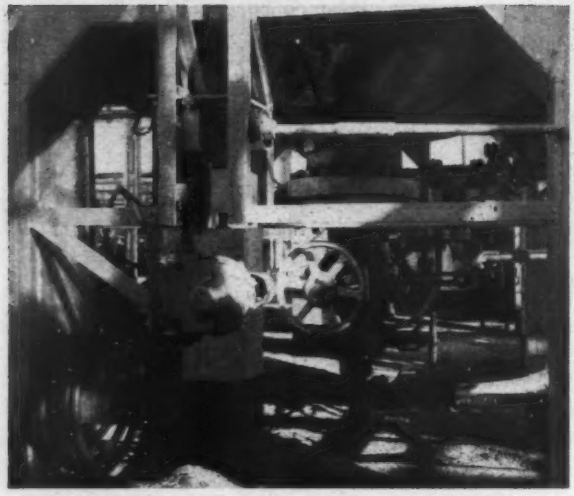
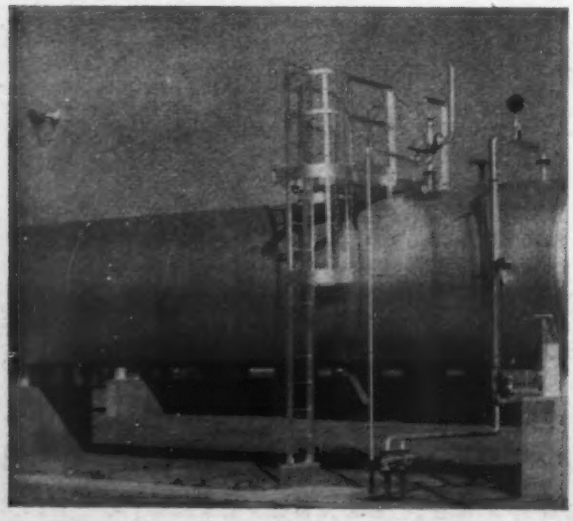


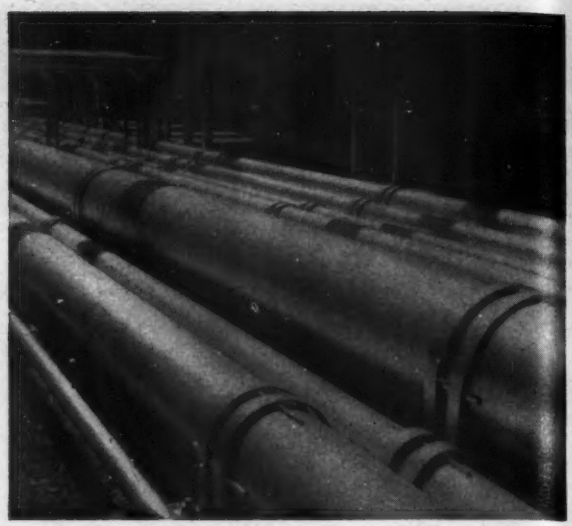
Emergency Hookup for Dropout Valve

MADE from salvaged automobile parts, to meet the needs of wartime emergency, the arrangement shown here provides remote control for a dropout valve on a cracking unit. Along with the spur gears, which were obtained from another source, the gearing provides a 14 to 1 ratio.

Safety Platforms for Storage Tanks

BASKET-TYPE guards on the ladders and platforms with handrails are standard equipment on the horizontal tanks at the new Holliday, Tex., plant of Warren Petroleum Corp. These safety devices are of a similar type to those used for fractionating columns and the like.



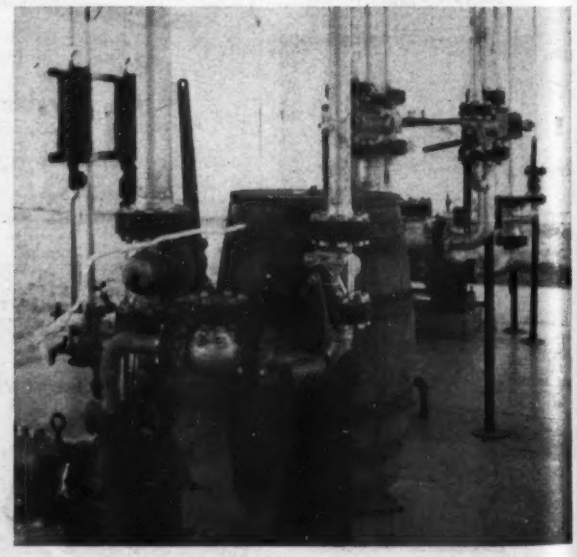


Wear to Pipe at Point of Holddown Eliminated

IN order to avoid injury to pipe walls due to wear at points where holddown clamps come in contact with the line, bars such as shown in the photograph are installed. The bars, long enough to provide ample bearing over the full range of the line's expansion travel, are located 90° apart on the top and sides of the pipe. Attachment is made by tack welding both sides of the bars at each end and at their center.

Efficient Water Cooler

DRINKING water for the operating personnel at the Holliday, Tex., plant of Warren Petroleum Corp., is chilled by a coil which is refrigerated from the expansion of propane. The cooler, a permanent installation in the plant, is made of an ordinary wood water barrel and some 20 ft. of copper tubing. The coil was made by forming the tubing around a section of pipe for the desired number of turns. Since the tubing passes through the barrel staves above the water line no packing or gaskets are required to prevent water leaks at these points.



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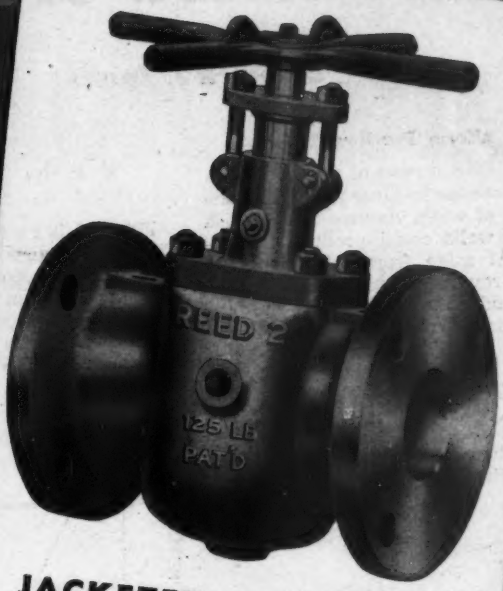

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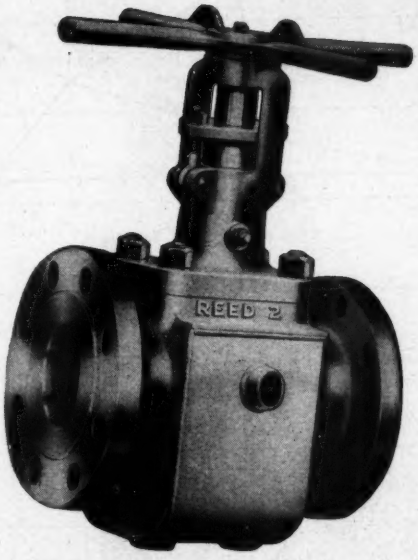

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MIGRATION OF OIL

OIL PRODUCTION by water

PART 11 OF A SERIES

by Park J. Jones*

IT is said that a lessee is entitled to a reasonable opportunity to produce his oil. However, because of migration, the opportunity to produce oil by water for the first row of wells nearest to water is in the ratio of the first row producing rate to the total rate of production from a reservoir.

Uniform Per-Row Rates

CONSIDER n rows of wells. Let A_i denote the in-place reserve for the ith row of wells. Assume that the ith row of wells could produce the reserve A_i aside from migration. Let the per-row rate of production be uniform. Under these conditions, the per-row ultimate recovery U_i is defined by:

$$U_i = U_{i-1} + \frac{A_i}{n+1-i} \qquad (1)$$

For instance, the ultimate recovery for the first row (i = 1) is:

$$U_1 = \frac{A_1}{n}$$

for the second row (i = 2):

$$U_2 = U_1 + \frac{A_2}{n-1}$$

and for the last row (i = n) most distant from water:

$$U_n = U_{n-1} + A_n$$

Suppose the per-row reserve is uniform. Denote the total reserve by unity. The corresponding per-row reserve A_i is equal to 1/n and the per-row ultimate recovery is given by:

$$U_i = U_{i-1} + \frac{1}{n(n-i+1)} \qquad (2)$$

Fig. 11-1 is a solution of Equation 2. The vertical distance between reserve and ultimate recovery is per-row migration. The sum of the vertical distance gives the curve for cumulative migration.

The cumulative migration is 33.18

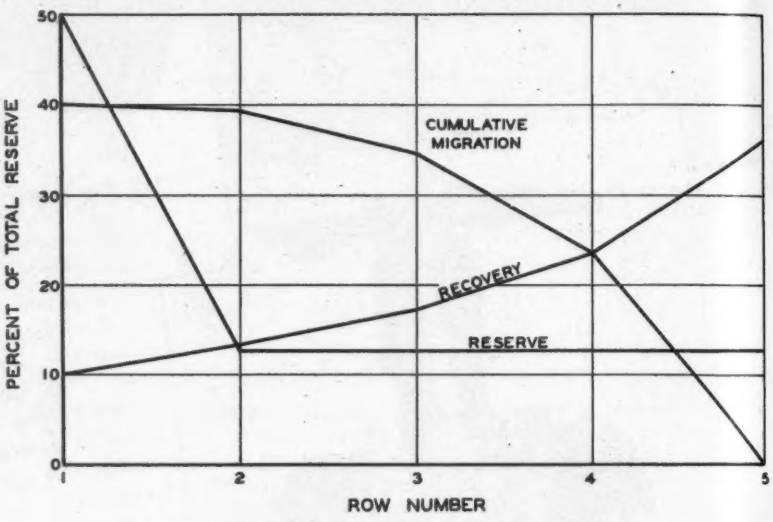

Fig. 11-2—Reserve, ultimate recovery, and cumulative migration vs. row number for uniform per-row producing rate

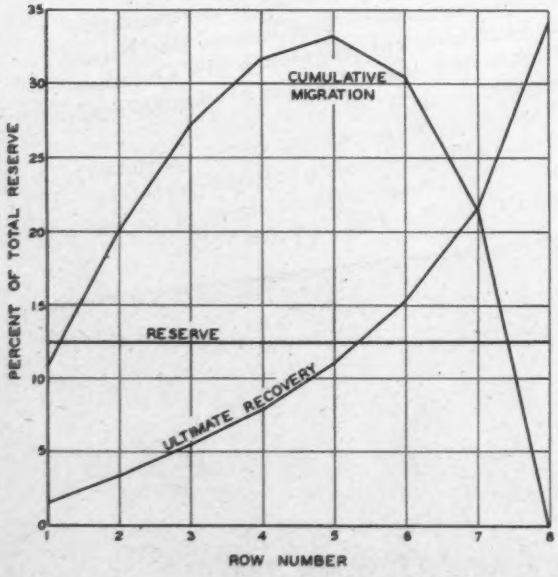

Fig. 11-1—Reserve, ultimate recovery, and cumulative migration vs. row number for uniform per-row reserve and producing rate

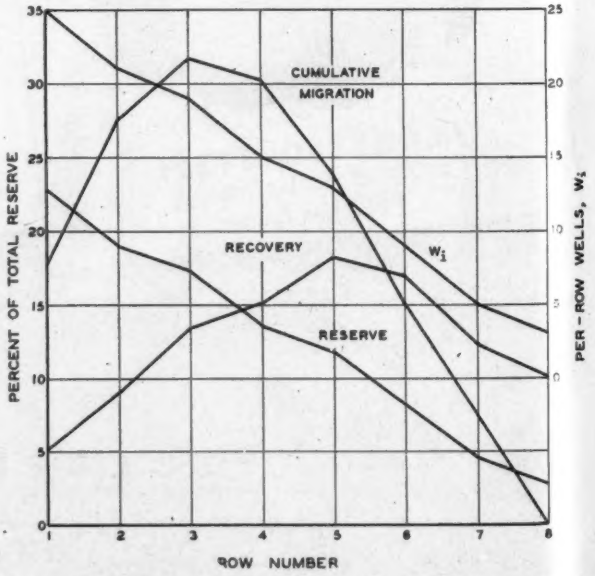

Fig. 11-3—Reserve, ultimate recovery and cumulative migration vs. row number for uniform per-well producing rate

*Production consultant, Houston.

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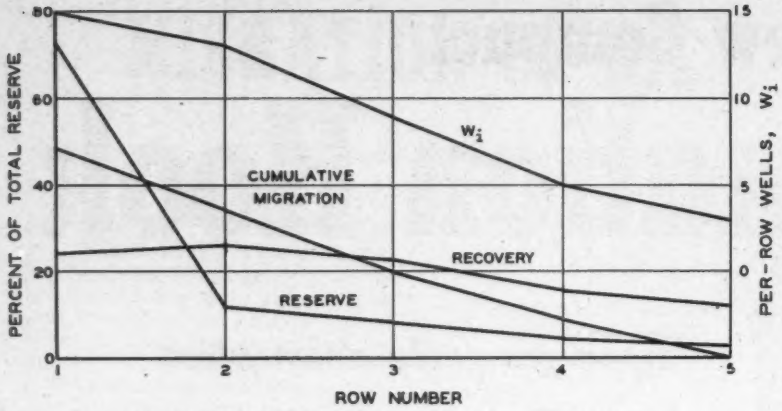

Fig. 11-4—Reserve, ultimate recovery, and cumulative migration vs. row number for uniform per-well producing rate

per cent of the initial reserve. This migration is across the fifth row. The initial reserve downdip from the fifth row is five-eighths of the total reserve. So the cumulative migration is 53.09 per cent of the initial reserve on the downdip side of the fifth row. The leases on the downdip side of the fifth row lose more than 50 per cent of their reserve if oil production is by encroaching or injected water.

Suppose the per-row rate of production is uniform but the per-row reserve is variable. Equation 1 also applies to this condition. The data in Fig. 11-2 are an illustrative example. The initial reserve downdip from the first row is 50 per cent of the total reserve. The ultimate recovery for the first row is 10 per cent. The cumulative migration is 40 per cent across the first row.

Uniform Per-Well Producing Rates

The ultimate per-row oil recovery varies with the number of wells on a row and with the per-well producing rate. Consider uniform per-well producing rates. Denote the in-place recoverable oil for the ith row by A_i. For illustrative purposes, assume that an ith row of wells could recover the reserve A_i aside from migration. Let there be W_i wells in the ith row. Let n equal the number of rows before abandonment of any row. Denote the per-well producing rate by unity. Then the relative per-row producing rate is given by $W_i/\Sigma W_i$. Under these conditions, the per-row ultimate oil recovery U_i is defined by:

$$U_i = \frac{U_{i-1}}{W_{i-1}} W_i + \frac{A_i W_i}{\sum_{i}^{n} W_i} \qquad (3)$$

For instance, the ultimate recovery for the first row is given by:

$$U_1 = \frac{A_1 W_1}{\sum_{1}^{n} W_i}$$

and for the second row, by:

$$U_2 = \frac{U_1 W_2}{W_1} + \frac{A_2 W_2}{\sum_{2}^{n} W_i}$$

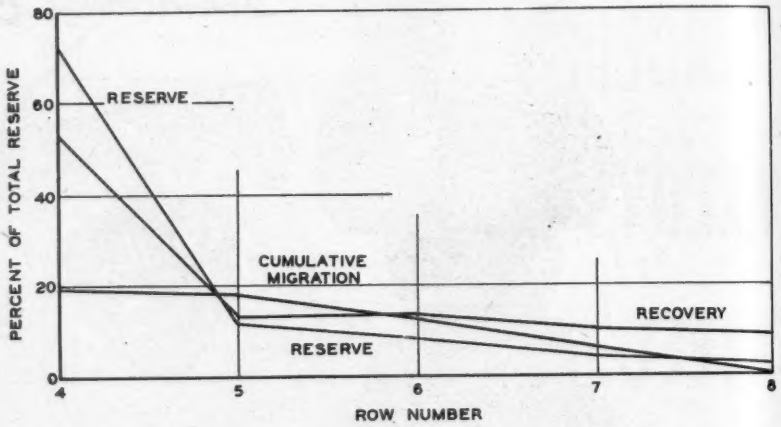

Fig. 11-6—Reserve, ultimate recovery, and cumulative migration vs. row number for per-row producing rate proportional to per-row initial reserve and rows 1, 2, and 3 not developed; see Fig. 11-5

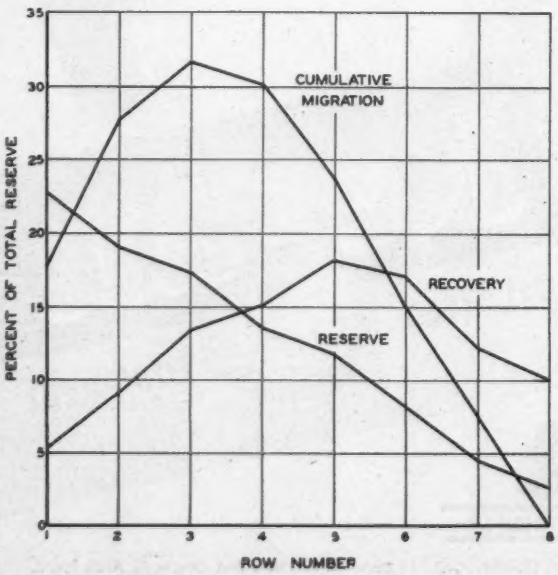

Fig. 11-5—Reserve, ultimate recovery, and cumulative migration vs. row number for per-row producing rate proportional to per-row initial reserve

and for the last or nth row, by:

$$U_n = \frac{U_{n-1} W_n}{W_{n-1}} + A_n$$

Fig. 11-3 illustrates a solution of Equation 3 for eight rows. The number of wells per row varies from 3 up to 25. The cumulative migration in this example is about 31.6 per cent across the third row.

The first row is nearest to water and has 25 wells. Ultimate recovery for the first row is 5.18 per cent. The eighth row is a crestal row and contains only three wells. The ultimate recovery for the eighth row with only three wells is 10 per cent. The per-well ultimate recovery for crestal wells to the per-well recovery for the wells nearest to water is in the ratio of 10(25)/5.18(3) or about 16:1. A crestal well in this example accumulates 16 bbl. of oil for each barrel of oil accumulated by a flank well.

Evidently, the drilling of a comparatively large number of wells is no protection against migration of oil

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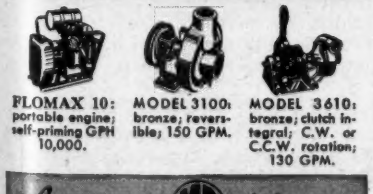

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when per-well producing rates are uniform.

Suppose Rows 1, 2, and 3 of Fig. 11-3 are not drilled. The migration would be as shown in Fig. 11-4. The initial reserve for the first row is 72.80 per cent of the total reserve. The ultimate recovery for the first row is 24.24 per cent. The cumulative migration across the first row is 48.56 per cent.

The per-well ultimate recovery for crestal wells to that for the wells in the first row is in the ratio of 11.89(15)/24.24(3) or 2.45:1. In this example, a crestal well accumulates 2.45 bbl. of oil for each barrel of oil accumulated by a well on the first row.

Producing Rate Proportional to Reserve

Consider per-row producing rates proportional to per-row initial oil reserve. The effect of migration on ultimate recovery for producing rates proportional to initial reserve may be obtained as follows: Let A_i denote the initial oil reserve for the ith row and R, for a reservoir. It can be verified that:

$$U_1 = \frac{A_1 (A_1)}{R}$$

$$U_2 = \frac{A_2 (A_1 + A_2 - U_1)}{R - A_1}$$

$$U_3 = \frac{A_3(A_1 + A_2 + A_3 - U_1 - U_2)}{R - A_1 - A_2}$$

and that in general:

$$U_i = \frac{A_i (\Sigma A_i - \Sigma U_{i-1})}{R - \Sigma A_{i-1}} \quad (4)$$

where ΣA_i is the reserve downdip from the ith row, ΣU_{i-1} is the ultimate recovery for all the rows downdip from the ith row and ΣA_{i-1} is the initial reserve downdip from the (i — 1) row.

Fig. 11-5 is a solution of Equation 4 for eight rows of wells. The initial reserve for the first row is 22.8 per cent. But the ultimate recovery for the wells on the first row is only 5.2 per cent. The migration across the first row is 17.6 per cent. This migration is essentially the same as that in Fig. 11-3.

Suppose Rows 1, 2, and 3 are not developed. This condition is mapped out in Fig. 11-6. The initial reserve for the structurally lowest row is 72.8 per cent. The ultimate recovery is 50.3 per cent. The migration across the structurally lowest row is 19.8 per cent. Whereas, in Fig. 11-4, the corresponding migration is 48.56 per cent. In this instance a change from per-well uniform producing rates to per-row producing rates proportional to reserve reduced migration from 48.56 down to 19.8. The difference (48.56 — 19.8) or 28.76 per cent is partial pro-

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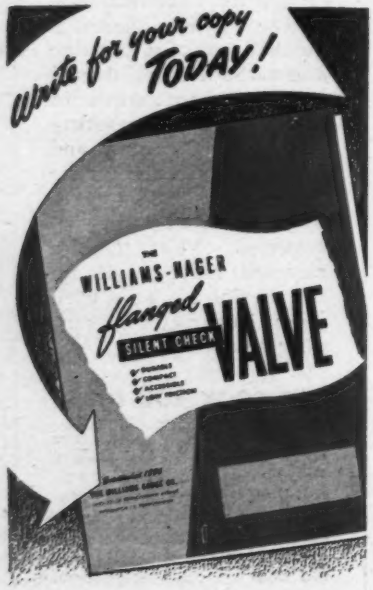

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tection against migration. Nevertheless, 19.8/72.8 or 37.2 per cent of the initial reserve for the structurally lowest row migrates across the row.

Migration and Production of Water

The above considerations show that most of the oil on the downdip side of the structurally lowest rows of a fully developed reservoir migrates updip across the rows. This migration is based on the assumption that water also migrates across the structurally lowest rows.

However, suppose the water-producing capacity of the structurally lowest wells exceeds the rate of water migration. In such cases, oil migrates in the downdip direction.

Consider a contour midway between the center of a radial reservoir and its water contact. The productive area on the downdip side of the midway contour is three times the productive area within the midway contour. Based on uniform per-well acreage, there are three times as many locations on the downdip side as on the updip side irrespective of spacing patterns.

The rate of water encroachment into a reservoir usually does not exceed the water-producing capacity of the downdip wells. So the production of water causes downdip migration of oil and forces the pumping of all wells when the reservoir pressure approaches the minimum bottom-hole flowing pressure.

Location of Wells

Evidently, migration of oil does not favor crestal locations unless the rate of water encroachment exceeds the water producing capacity of the downdip wells.

On the other hand, there is no profit in producing water. Furthermore, a decline in reservoir pressure below, say, 75 per cent of saturation pressure, is likely to decrease well capacity by at least 50 per cent aside from any water in production. A decline in reservoir pressure below 75 per cent of saturation pressure is also likely to result in a loss of reserve.

Wells should be located updip from the viewpoint of investments and operating expenses. Wells should also be located updip from the viewpoint of oil-producing rates and ultimate oil recovery. Cooperative or unit operations may be required in order that royalty and working interests can realize the benefits of updip location of wells in producing oil by encroaching or injected edge water.

Reasonable Opportunity

It is said[1] that a lessee is entitled to a reasonable opportunity to produce his oil. However, because of migration, the reasonable opportunity to produce oil by water from the row of wells nearest to water is in the

(Continued on page 74)

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ratio of first-row producing rate to the total rate. Hence, to recover a first-row reserve, all wells other than those on the first row have to be shut in. The reasonable opportunity for the first row is 100 per cent. But the producing rate for the wells on the (n — 1) rows is zero until the first row accumulates its reserve. To recover half of its reserve, the rate of production has to be 50 per cent of the total producing rate. The reasonable opportunity for the first row is 50 per cent. But the producing rate for the wells on the (n — 1) rows is only 50 per cent of the total rate. When all wells are produced, the reasonable opportunity for the first row is in the ratio of the average first-row producing rate to the total average rate.

Reference

1. "Standards on Allocation of Oil Production," an A.P.I. committee progress report, Dallas, 1942.

BOOKS

A.P.I. IN CHICAGO. Ethyl News for December 1946. Published by Ethyl Corp., 405 Lexington Avenue, New York City. 64 pp.

This souvenir convention issue of Ethyl News is handsomely printed, and records, pictorially, the record-breaking gathering of oil men during the recent A.P.I. convention. It is devoted to pictures of everyone—delegates and speakers—whom it was possible to photograph at random.

THE INDEPENDENT PETROLEUM COMPANY. Hearings before a special committee investigating petroleum resources, U. S. Senate. U. S. Government Printing Office, Washington. 569 pp.

This book presents the testimony of the various witnesses appearing before the O'Mahoney committee last spring.

PIPE IN AMERICAN LIFE. Published by Committee on Steel Pipe Research of American Iron and Steel Institute, 350 Fifth Avenue, New York. 48 pp. Single copies gratis.

This booklet presents the historical background and modern uses of metal pipe, with emphasis on the use of steel pipe. Chapters are devoted to uses of steel pipe in homes, large buildings, process industries, railroads, shipping, mining, water-supply systems, the oil industry, the gas industry, refrigeration, irrigation, and on farms.

SYMPOSIUM ON MATERIALS FOR GAS TURBINES. Published by American Society for Testing Materials, 1916 Race Street, Philadelphia. 200 pp. $3.

This timely publication of the five technical papers comprising the symposium as presented at the A.S.T.M. annual meeting in June 1946, and three additional papers provides in condensed form a great deal of pertinent information and data, much of it published for the first time, on the development of materials for gas turbines which were so important in the nation's war effort. The symposium not only provides condensed versions of more pertinent researches and resulting data carried out over the past 2 or 3 years, but it is significant from the standpoint of future implications of gas turbines, jet engines, and related applications. The text is profusely illustrated with tubular and graphic data.

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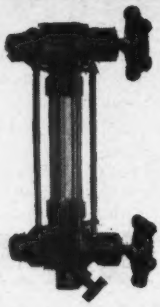

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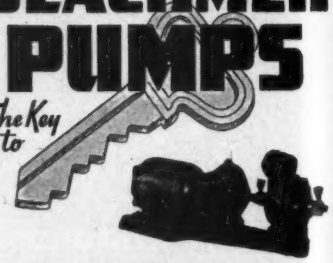

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Electronic Detonation Indicator

(Continued from page 55)

ing ELI-Phillips Model 102-A meters. These data were averaged to give the values which are reproduced in Fig. 8 together with the standard aural framework from the same report.

Sometime ago a program was conducted among the Phillips laboratories to determine any improvement in rating reproducibility which accrues from the use of the 102-A meter for meter rating versus aural rating. Eleven samples were rated on four engines. Altogether, 44 ratings were obtained, 22 aurally and 22 using the Model 102-A detonation meter. The upper half of Fig. 9 is a field plot of the deviation of each point from the average octane rating for that fuel. Ninety-one per cent of the meter ratings had a deviation of 0.5 per cent S in M reference fuel or less, while only 56 per cent of the aural ratings were within those limits. These same data rendered in the form of distribution curves in the lower half of Fig. 9 emphasize that the probable error for the method when employing the meter is considerably less than when the ear is used.

TABLE 1—COMPARISON OF RATING REPRODUCIBILITY OBTAINED BY EAR AND WITH ELI-PHILLIPS DETONATION METER MODEL 102-A ON THE F-4 ENGINE

	F-4 Rich Ratings on Aviation Fuel 28R			
	Meter data		Aural data	
Rating No.	Rating	Deviation from average	Rating	Deviation from average
1	1.43	.03	1.51	.04
2	1.47	.07	1.39	.08
3	1.40	.00	1.53	.06
4	1.35	.05	1.30	.17
5	1.25	.15	1.56	.09
6	1.43	.03	1.47	.00
7	1.50	.10	1.55	.08
Average rating	1.40	..	1.47	..
Standard deviation	..	.077	..	.089

Another reproducibility check was made by taking all the rich mixture ratings which had been run in the Phillips research laboratory for various programs in which both ratings by ear and by meter were obtained. These ratings, presented in Table 1, indicate again a definite improvement in the standard deviation when using the detonation meter.

7. A Steady Reading Meter

From the operator's point of view there is considerable desire for a meter that reads zero when the engine is not knocking and which gives a steady reading, under knocking conditions, whose value is directly related to audible knock intensity. Since there is considerable irregularity in both the knock intensity and the number of detonation events per unit of time, a simple time average of these events gives a value which fluctuates a great deal when reasonable averaging times are used. The average number of detonation events in a given time interval varies a great deal over the range of fuel-air ratios and power levels at which the engines are operated. This is quite apart from the variations at any particular set of fixed conditions. The deflection of a simple averaging meter is approximately

$$D = K h_{av} n_{av} \qquad (1)$$

where

h_{av} = the average knock intensity (amplitude)

n_{av} = the average number of knocking cycles per second

k = a constant

D = meter deflection

It has been found that in the aural methods of rating, the type of meter which gives readings according to Equation 1 does not correlate with

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the ear. On the other hand an instrument which is capable of measuring h alone has been found to give ratings which agree very well with the aural ratings. The manner in which this measurement can be made is:

Let N_1, N_2 be two magnitudes such that

$$N_1 = k_1 h_{av} n_{av}$$
$$N_2 = k_2 n_{av}$$

then the ratio,

$$\frac{N_1}{N_2} = \frac{k_1 h_{av} n_{av}}{k_2 n_{av}} = k h_{av} \quad (2)$$

will be independent of variations in n_{av}. If then an electronic instrument is constructed which performs the various mathematical operations outlined above and gives a meter reading according to Equation 2, the readings will be proportional to the average knock amplitude. Such readings are much steadier on a given engine than the sample averaging type since the effect of one random variable has been removed. This has been confirmed by tests performed with the instrument constructed upon this principle.

Fig. 10 shows a functional diagram of a detonation meter which has such a response. The tuned amplifier, threshold, and pulse amplifier function as in Model 102-A to give short time exponential pulses whose amplitudes are proportional to **h**, the peak detonation intensity. These pulses are introduced into two channels. The first channel consists of a multivibrator circuit which emits a pulse of approximately rectangular shape as shown at **(b)** for each exponential pulse received. The rectangular pulses, however, are independent in amplitude and duration of the height of the detonation pulses. Therefore the voltage output of the integrator which accumulates these rectangular pulses is proportional to n_{av}, the average number per second. This voltage is used to control the amplification of the variable gain amplifier in the other channel. The control characteristic is made to be inversely proportional to the voltage output of the multivibrator channel. This performs the division operation of Equation 2 since, by choice of constants, voltage to variable gain amplifier is on average approximately

$$N_1 = k_1 h_{av} n_{av}$$

and the amplifier gain is

$$g = \frac{1}{k_2 n_{av}} = \frac{1}{N_2}$$

then average voltage output will be

$$(N_1)g = \frac{N_1}{N_2} = k h_{av}$$

which is the desired result. This value is then indicated on the meter **M.**

In Fig. 11 is shown a set of performance curves obtained on the F-4 engine using both the steady reading meter and the ELI-Phillips Model 102-A meter. It may be seen that the shape and the location of the curves agree quite well. In Table 2 is shown a group of comparative ratings obtained on the F-4 engine using the steady reading meter and the ELI-Phillips Model 102-A meter.

TABLE 2—F-4 RICH RATINGS OBTAINED WITH PHILLIPS STEADY READING AND ELI-PHILLIPS MODEL 102-A DETONATION METERS

Fuel designation—	F-4 Rich Ratings: Phillips Steady Reading meter	F-4 Rich Ratings: ELI-Phillips 102-A meter
Standardization fuel	2.20	2.20
Standardization fuel	2.00	2.43
RAFD-43-44	99.3	0.00
RAFD-43-44	98.4	98.3
RAFD-43-44	98.9	99.1
RAFD-45-44	1.45	1.56
RAFD-45-44	1.74	1.70
RAFD-45-44	1.47	1.39
140-P	2.30	2.43
140-P	1.95	2.00

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1. Lewis, Bernard; The Experimental Side of Combustion Research in Engines, Vol. II, The Chemical Background for Engine Research, Interscience Pub., Inc., 1943, pp. 165-234.
2. Draper, C. S.; The Physical Effects of Detonation in a Closed Cylindrical Chamber, N.A.C.A. Report 493, 1934.
3. Cummings, H. K.; Rating Aviation Fuels in Full-Scale Aircraft Engines, Cooperative Fuel Research Committee Report, S.A.E. Transactions, 1938, p. 497.
4. C.R.C. Handbook, 1946.

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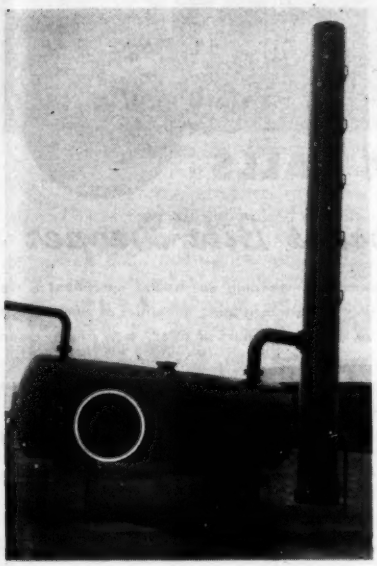
Plant Practices:

Receiver For Still Blowdown

SAFETY and efficient recovery of blowdown materials from pressure stills and from other processes are some of the features of the installation shown in the photograph. Provided with a manway opening for inspection and cleanout purposes, the horizontal tank serves to separate vapors and liquid during blowdown periods. Vapors are taken from the receiver tank at the end opposite the blowdown inlet and enter the stack counterflow to a sprayed water column. Five spray heads centered in the stack are supplied automatically with water when the temperature of the inlet line to the receiver reaches a predetermined temperature. A simple temperature controller (circled in picture) of the on-and-off direct-acting type having its thermometer element in the inlet line and its valve in the water supply line meets adequately all operating needs.



The stack is closed off about 2 ft. above its base with a welded bulkhead and with the exception of the spray heads is free of internal obstructions throughout its length. Also, the top of the stack is open and vent holes are located in its shell between bulkhead and base. An open drain is located in the stack shell about 5 ft. above the base. No valves are installed in the open drain which runs to the refinery's central oil-separator trap. The bottom drain which connects into the open drain is provided with a valve that is normally kept closed.

All water lines are to be steam traced and insulated before the end of summer to prevent freezing. The receiver drum is provided with a pumpout line which is connected into its shell near one end at the bottom.

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Rigging Up

THE matter of efficiency in moving a rig to the location and of rigging up is a relative one. There are too many factors affecting these operations to permit setting up of uniform standards of efficiency. Size of the rig, type of terrain, weather, all have an effect on the progress of operations. There is considerable difference between the amount of time needed for moving in and setting up in case of a campaign of drilling out a number of adjoining locations and in case of drilling an isolated location.

Because of the above considerations only averages for a large number of wells of a certain depth group are of interest and of value. By restricting the analysis to a given depth group the effect of the factor of the rig size is considerably reduced. By considering a large number of wells the effect of weather and terrain conditions is averaged out.

Recent study of 70 wells drilled in Texas, Louisiana, and Florida indicates that the moving in and rigging up time averaged 6.66 per cent of the total rig time.[1] The term "total rig time" is employed here to cover all operations needed for drilling of an average well. The depth the wells were drilled to was 9,000 ft. or more with a 10,520-ft. average. Since the average total rig time of these wells was 123 days, the average moving in and rigging up used up around 8 days of this total.

The improvement during the past 10 years or so in the efficiencies of moving in and rigging up is a result of a number of factors which may be summarized as follows: (1) Recognition of the value of suitable roads to the location; (2) improved moving equipment and methods; (3) standardization of location layouts, and (4) unitizing of rig equipment. Discussion of these four factors must be preceded by certain general considerations.

General Considerations

In the case of many operators and drilling contractors the efficiency of moving in and rigging up has been brought up to the point where further saving of time would have to be done at the expense of other operations. For instance, an equipment lighter than actually needed may facilitate moving in, or certain shortcuts in assembling of machinery may save a few hours of rigging-up time. However, the primary consideration in drilling a well is to have equipment which is amply capable of meeting the drilling conditions expected. The equipment must be well set up if it is to perform satisfactorily the functions for which it has been designed.

However, there are many operators, and even drilling contractors, who did not reach this degree of efficiency and who could save considerable time and money by more thorough planning of these two preliminary operations of oil-well drilling. Two methods of approach are possible. The whole problem may be left to the tool pusher in charge of the rig, or standard layouts may be worked out, blue printed, and adhered to.

There are many cases which may be cited as an example that under the first arrangement rigs are moved and rigged up in the most efficient way possible. Other cases are not as satisfactory. The main difficulty of this solution is the fact that if the tool pusher leaves the organization, or is transferred to another rig, his successor has definite ideas about moving in and rigging up. Whether or not they are an improvement, these ideas are usually quite different from those of his predecessor. The results are changes, interruptions of schedules, and need for reeducation of the crews.

Too rigid adherence to the second arrangement may also bring unsatisfactory results. Practical considerations require considerable flexibility in the standards adopted. Need arises, for instance, quite frequently for moving certain parts of the equipment from one rig to another. Unless provisions are made for certain alternate arrangements, such changes may deprive the original plans of all their value in a relatively short time.

Present trend is definitely toward flexible standardized schedules and layouts. A number of operators followed this procedure before the war. During the war, however, shortages of manpower, moving equipment, tires, and gasoline made it necessary to do the best with what was available. In the meantime the conditions were changing and with the war over the old arrangements were obsolete.

Roads

Even disregarding special cases of drilling in marshes or on submerged or offshore locations, access to a drilled well is usually quite difficult. For a considerable time little or no attention was paid to the roads to the location, the belief being quite general that investment in a road is not justified until production is actually developed. Change of this concept was brought about not only by advent of the heavier equipment, which required good roads if it was to be moved at all to the location, but also by realization of advantages of providing a drilled well with means of good communication.

Maintaining of the uninterrupted stream of supplies to the well increases the efficiency of drilling operations. Ability to move to the well, rapidly, large quantities of cement or mud, in case of an emergency, may mean the difference between overcoming the difficulty and losing the hole. With large investment in the deep wells as now drilled this, of course, is an important consideration. Maintaining of the morale of crew and ability to remove rapidly an injured man in case of accident is an important factor. Ease of moving the heavy equipment of the technical-service companies reduces idle rig time.

Because of these considerations a good road to the location is a necessary adjunct to modern drilling operations, although in many cases it may represent considerable investment. Board roads are still predominant although with present poor quality and high price of lumber they do not represent an economical solution. Experiments are contemplated with steel matting, developed during the war for the portable airports. A road built of such a matting would be easy to construct, would require little or no grading, and would be highly salvable. If such a road does not prove practical, the matting may be of value as an inexpensive foundation for the road.

References

1. Douglas Ragland: "Drilling Equipment Needs"—A paper presented before the American Association of Oil Well Drilling Contractors, Oklahoma City, October 2, 1945.

No. 3 in a series by Joseph Zaba, petroleum engineer, Houston

QUESTIONS on TECHNOLOGY

by W. L. Nelson
Consulting Engineer

Characterization Factors of Bureau of Mines Crude Oils

What is the characterization factor of a crude oil? How is it related to the names given crude oil by the Bureau of Mines?—B. T. B.

Characterization factor was introduced by Watson and Nelson in 1933 in "Improved Methods for Approximating Critical and Thermal Properties of Petroleum Fractions," Ind. Eng. Chem. 25, 880 (1933). They and their later coworkers classify crude oils and stocks as follows:

Pennsylvania stocks	12.2—12.5
Mid-Continent stocks	11.8—12.0
Gulf Coast stocks	11.0—11.8
Cracked gasoline	11.5—11.8
Cracking-plant combined feeds	10.5—11.5
Recycle stocks	10.0—11.0
Cracked residuum	9.8—11.0

No formal values of characterization factors have been stated by the U. S. Bureau of Mines, but since both the characterization factor and the Bureau of Mines classification system involve the same properties, i.e., gravity and boiling point, it is possible to state an approximate relationship. Characterization factor may be defined as—

$$K = \frac{\sqrt[3]{T_B}}{S}$$

in which T_B is the average molal boiling point in °R (°F. plus 460) and S is the specific gravity at 60° F. The Bureau of Mines classification system involves the boiling points of two key fractions (No. 1, 504° F., and No. 2, about 756° F.) and their gravities. Thus the Bureau of Mines names as indicated in Table 1 can be described in terms of characterization-factor numbers. The first name or number refers to the properties of the low-boiling part of the crude oil and the second name or number referring to the higher-boiling or lubricating-oil portion of the crude oil.

Thus, the name **paraffin base** is applied to crude oils (low or high-boiling part, or both) if the characterization factor exceeds about 12.0, **naphthenic base** if the factors are below about 11.5, and **intermediate base** if the factors lie between about 11.45 and about 12.1.

TABLE 1—CHARACTERIZATION FACTORS OF CRUDE OILS

B. of M. name of crude oil		A.P.I. Gravity at 60° F.		
Low-boiling	High-boiling	Key fract. 1	Key fract. 2	Approx. U.O.P. Charact. factor
Paraffin		40+	30+	12.2+
Paraffin	Intermediate	40+	20—30	12+ & (11.4—12.2)
Paraffin	Naphthene	40+	20—	12+ & 11.4—
Intermediate	Paraffin	33—40	30+	(11.5—12) & 12.2+
Intermediate		33—40	20—30	11.4 & 12.1
Intermediate	Naphthene	33—40	20—	(11.5—12) & 11.4—
Naphthene		33—	20—	11.4—
Naphthene	Intermediate	33—	20—30	11.5 & (11.4—12.2)
Naphthene	Paraffin	33—	30+	11.5— & 12.2+

Wax and Wax Distillate

Can you give us the specifications of wax and wax distillates?—E. N. P.

Wax distillate that is to be dewaxed by the conventional or old-fashioned filter-press method must have a low viscosity in order to exhibit suitable filtration characteristics. In addition, its high-boiling portion must not exceed an atmospheric boiling point of about 885° F. (650° F. at 40 mm. pressure). Some refiners prefer to limit the boiling range to 835° F. Not only does a low viscosity assist in maintaining a crystalline wax structure but it allows a more rapid rate of filtration. Saybolt viscosities up to 100 seconds at 100° F. have been successfully filtered by some refiners but others like to keep the viscosity down to 65 seconds.

With respect to light waxy stocks which will be dewaxed by solvent methods, the characteristics of the wax distillate are not usually critical, but it is advisable to work closely with filtration equipment manufacturers and process licensors.

Paraffin wax is listed in the trade journals as:

Western Pennsylvania—white crude scale: 122-124 A.m.p.; 124-126 A.m.p.

Mid-Continent — semirefined: 132-134 A.m.p.

Chicago—fully refined: 122-124 E.m.p.; 125-127 E.m.p.; 127-129 E.m.p.; 130-132 E.m.p.; 132-134 E.m.p.; 135-137 E.m.p.

The symbol E.m.p. refers to the A.S.T.M. method of determining melting point which is 3° F. lower than the A.m.p. or American melting point.

Federal specification VV-P-121 (February 24, 1942) for paraffin wax states that the product must be refined petroleum wax, free from animal and vegetable waxes or other adulterants. The grades and types are:

Melting point, °F.:	Type 1	Type 2	Type 3
Grade A	120-132	130-132	130-132
Grade B	125-127	125-127	125-127
Grade C	120-122	120-122	120-122
Color	plus 28	plus 23	plus 20
Odor	None	Moderate	.....
Taste	None	Slightly oily	Oily
Oil & moisture, per cent	.....	0.5 max.	1.0 max.

Paraffin wax is used in so many ways (sealing, matches, paper, candles, candy, polishes, insulation, etc.) that general specifications such as those outlined above are of little value. Rather it is necessary to meet the requirements of users by special tests and by the development of particular properties. Thus, each manufacturer finds customers who can use his wax.

Viscosity of Natural Gas and The Effect of Pressure

The properties of natural gas vary all over the map. Can you give us data on the viscosity at various temperatures and the effect of pressure on viscosity?—D. L.

Apparent lack of agreement among data is due primarily to the fact that natural gas ranges widely in composition and because at high pressures the behavior of gases with respect to viscosity is more like that of liquids than that of true gases. Thus, at pressures below the critical pressure the viscosity of a gas decreases with increases in temperature whereas at high pressures the viscosity of a gas decreases as the temperature is increased. Perhaps the first extensive correlation of viscosity data was published by the author of this page in the July 13, 1939 (page 50), issue of The Oil and Gas Journal and the correlation is in print now on page 127 of the second edition of Petroleum Refinery Engineering (McGraw - Hill Book Co., Inc., New York, 1941).

Although the above correlation is reasonably accurate for most engineering work, more complicated studies have been made. One of the most recent of these is "A Universal Viscosity Correlation" (Natl. Pet. News, Tech. Section, Oct. 4, 1944) by Uyehara and Watson.

The effect of pressure is so pronounced that the charts mentioned above should be used. Nevertheless, Table 1 shows a few values for a mixture of 80 per cent methane, 20 per cent propane. In propane-rich mixtures the variations are much greater.

TABLE 1—VISCOSITY OF METHANE (80 PER CENT) PROPANE MIXTURES

Temp. (°C.)	Viscosity, micropoises at— 14.7 psia.	1,000 psia.	3,000 psia.	5,000 psia.
25	102	142	258	351
125	130	149	202	253
225	157	165	196	239

ENGINEERING *fundamentals*

A FEATURE OF THE OIL AND GAS JOURNAL

Corrosion and Pitting In Boiler Systems

CORROSION of metal in boiler systems can be of very serious consequence and can cause the deterioration and failure of operating equipment. This problem can be controlled with the establishment of proper feed water conditioning methods and with proper control of mechanical and chemical treatment.

Pitting and corrosion of boiler metals are due to any one of a combination of the following causes: Dissolved gases, acidity, electrolysis.

Raw-water source, method of feed-water treatment, and boiler design all influence the degree of difficulty which may be encountered with any one of the causes listed. It should also be pointed out that of the three causes listed, dissolved gases are the most common and electrolysis the least common of the causes of boiler-metal corrosion and pitting.

Dissolved Gases

Oxygen.—Oxygen is present in all raw-water supplies to some extent. As a rule under the same conditions, a river or creek water will have a higher oxygen content than a well water due to natural aeration over rocks, dams, etc.

The dissolved oxygen, if not removed from the feed water prior to the boilers, is liberated within the boilers upon elevation of the temperature to that corresponding to the pressure of operation. The liberated oxygen then becomes free to corrode the boiler metal, steam lines, and return lines. Usually, this type corrosion appears at or below the water line in the boilers.

For the proper elimination of dissolved oxygen from the feed water, either an open heater or deaerating heater should be installed. By maintaining saturation temperatures, the major portion of the dissolved oxygen is removed. With the supplemental feed of an oxygen reducing chemical, such as sodium sulfite, the last traces of oxygen can be eliminated.

Where proper-type heaters cannot be installed for some reason, corrosion and pitting can be minimized considerably with the use of sodium sulfite alone. The degree of success, however, depends upon the amount of oxygen present in the feed water, keeping in mind that the reaction between sodium sulfite and oxygen is not instantaneous although reaction time is decreased with an increase in temperature.

Carbon dioxide.—Carbon dioxide is also present in all raw waters—in greater quantities in well waters as compared with surface waters. This gas is also liberated upon elevation of temperature, in a similar manner to oxygen; thus dissolved carbon dioxide can be eliminated as well as dissolved oxygen by the use of proper-type feed-water heaters. However, all waters contain either carbonate or bicarbonate alkalinity. Elevation of the temperature will cause partial decomposition of these ions, releasing carbon dioxide gas. Therefore, although the dissolved carbon dioxide may be removed by heaters, only partial decomposition is accomplished upon elevation to normal feed-water temperatures and when the temperature is further increased to that of the boiler, further decomposition of these ions is inevitable. Because of this decomposition, carbon dioxide is present in all steams regardless of feed water conditioning. Another source of carbon dioxide is the unrestricted use of soda ash.

Carbon dioxide does not usually cause corrosion within boilers, and with elimination of the major portion through the use of feed-water heaters, internal corrosion due to carbon dioxide can be avoided.

Ammonia and hydrogen sulfide.—While not common constituents, these gases are frequently present in natural waters. Hydrogen sulfide, when dissolved in water, has acidic properties and therefore causes acidic corrosion in much the same manner as carbon dioxide. Ammonia, on the other hand, readily attacks copper and copper-bearing alloys.

With the installation of proper-type feed-water heaters, hydrogen sulfide can be minimized and corrosion from this source eliminated. Ammonia, however, is not removed even by properly operated heaters and is carried into the boilers and distilled with the steam. Where appreciable destruction of copper and copper bearing fittings is encountered, it is necessary to alter treatment methods or replace all copper and copper bearing fittings with metals which will not be attacked by ammonia.

Acidity

General corrosion or thinning of a boiler metal is frequently encountered wherever low alkalinity and pH values prevail. In order to eliminate corrosion of this nature, the pH of the boiler water must be maintained above 10.5.

Electrolysis

One type of electrolysis involves the exchange of electrons between two dissimilar metals in the presence of an electrolyte. Since boiler water is an excellent electrolyte, a local current may be established between two points, the metal higher in the electromotive series going into solution. If, for example, electrolysis were established between an iron fitting and a piece of equipment made of copper, the iron would dissolve and supply the electrons composing the local current.

Pitting and corrosion caused by electrolysis are very similar in appearance to that caused by dissolved oxygen, and are thus very difficult to distinguish. Since electrolytic corrosion is not frequently encountered, it should be made certain that all other sources of corrosion and pitting have been eliminated before assuming the trouble is due to electrolysis.

This material is from the Betz Handbook for Industrial Water Conditioning, written and published by W. H. and L. D. Betz, consulting engineers, Philadelphia.

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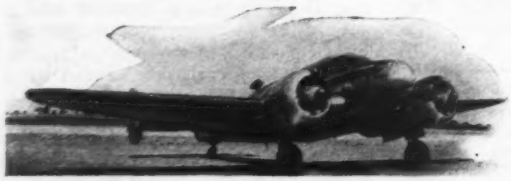

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The Refiner's Notebook

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

Fuel-Oil Properties

FUEL oils are so cheap that not much information on their use is available. Further confusion arises because of the many types of oil burners.

Flash.—Over 100° F. safety, below 230° F. for ease of ignition of distillate fuels used in vaporizing-type burners.

Pour.—Below expected storage temperature particularly for gravity feed to burners.

Ash.—Lime or soda that may flux with furnace walls, and scale, sand, rust, etc., that will plug screens and lines.

B.s. and w.—Same as ash but also carbonaceous and sludge-forming materials.

Carbon residue.—On 10 per cent A.S.T.M. residue indicates general coking tendency of distillate fuels in vaporizing-type burners. On residual fuel oils used in pressure or steam atomizing burners, means little.

10 per cent point.—Related to ease of ignition of vaporizing fuels.

90 per cent point.—Related to coke or carbon formation.

Sulfur.—Little significance except that low-temperature steel stacks are corroded.

TABLE 1—OIL TEMPERATURE FOR BURNERS

Furol vis. at 122° F.	Firing temp., °F. Mechanical	Steam
30	130-182	97-130
35	136-191	103-136
40*	143-199	108-143
45†	148-205	113-148
50	153-210	117-153
60	161-216	123-161
70	167-221	128-167
80	171-226	132-171
90	175-230	136-175
100	179-233	139-179
120	184-239	145-184
140	189-244	150-189
160	193-248	154-193
180	197-251	157-197
200	200-254	160-200
220	202-257	162-202
240	204-259	164-204
260	206-261	166-206
280	208-263	168-208
300‡	210-265	170-210

*Fuel 5 maximum. †Fuel 6 minimum. ‡Fuel 6 maximum.

TENTATIVE SCHEDULE OF REFINER'S NOTEBOOK

No. 123—Tube Weight
No. 124—Thermal Conductivity
No. 125—Wall Losses
No. 126—A.P.I. Gravity 50-100
No. 127—Fuel-Oil Properties
No. 128—Pipe-Still Outlet Temperature
No. 129—Equipment Losses
No. 130—Burner Types
No. 131—Transfer-Line Pressure Drop
No. 132—Viscosity—High Range

Viscosity.—See Table 1 for oil-firing temperatures. Change of viscosity requires adjustment of burner particularly with distillate fuels.

Thermal valve.—See Table 2 for approximate values.

Gravity.—Little significance except 10° A.P.I. fuel cannot be displaced by water and water emulsions separate slowly. Low-gravity fuels have best heating value on a volume basis but high-gravity fuels are best on a pound basis.

Blending for viscosity.—Cracked residual fuel oil cannot usually be mixed with distillate fuels (even cracked distillate) because sludge separates. Some straightrun residues behave in the same way.

TABLE 2—HIGHER HEATING VALUE OF FUELS

°A.P.I. gravity	Heating value, gross B.t.u./lb.	B.t.u./gal.
6	18,120	155,200
8	18,220	154,100
10	18,320	152,900
12	18,410	151,800
14	18,510	150,600
16	18,600	149,400
18	18,700	148,200
20	18,800	147,000
22	18,900	145,900
24	19,000	144,700
26	19,090	143,500
28	19,190	142,400
30	19,290	141,200
32	19,380	140,000
34	19,480	138,800
36	19,570	137,600
38	19,670	136,500
40	19,760	135,300
42	19,860	134,100

Stability.—No gum or sludging tests have been formally adopted.

Color and odor.—Not important in performance but customers want white and sweet fuels.

Diesel index, aniline point and carbon hydrogen ratio.—Are best indexes of coke or carbon-forming tendency of distillate fuel oils.

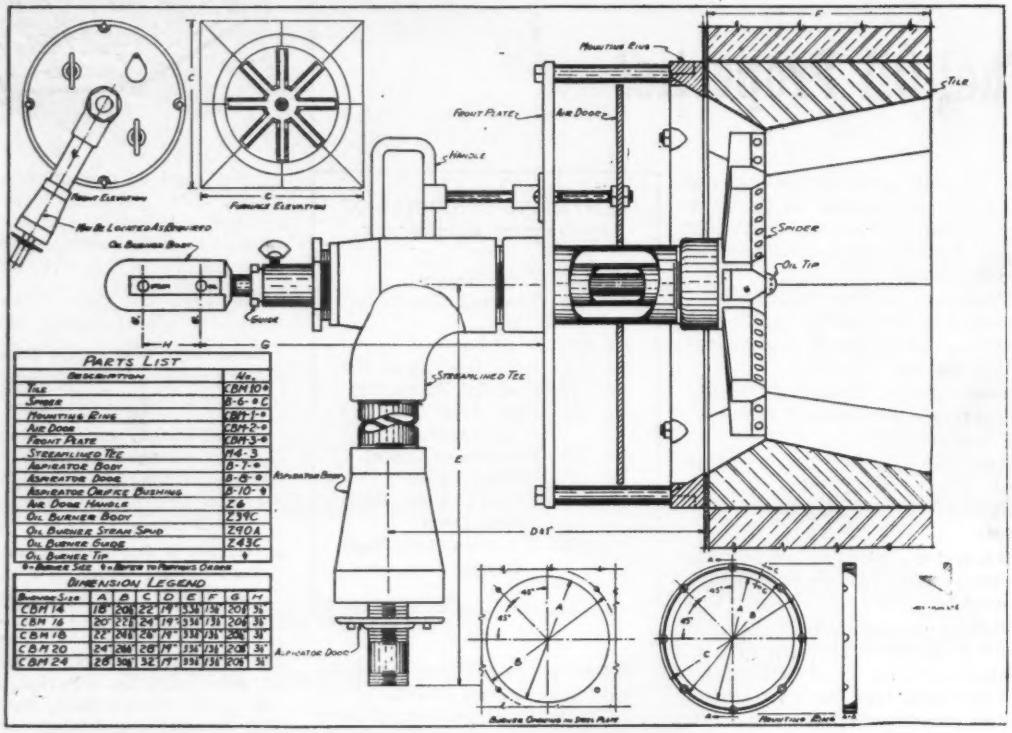
The performance of any particular burner is dependent upon many factors among which are viscosity of oil, angle of orifice, amount of steam, degree of mechanical atomization, rate of firing, etc. Thus, the characteristics of each burner must be developed by experience with the burner. Glendenning and Sullivan in "Characteristics of Fuel Oil," (Nat. Pet. News, p. 41, Aug. 21, 1936) present data on the performance of one pressure atomizing nozzle constructed for firing distillate fuel oil. They found for this particular burner that a maximum capacity was attained at 73 S.U.v. At lower and at higher viscosities the capacity was lower. Throughout the same tests, the angle of spray was found to vary as indicated in the following tabulation. At very high viscosities the burner nozzle failed to atomize the fuel properly; the fuel merely flowed from the nozzle.

Gal per hr. at 70° F., 110 psig.	S.U.v. at 100° F.	Angle of spray
...	34	*70°
3.0	35	67°
3.15	40	60°
3.25	43	53°
3.38	46	33°
3.67	52	23°
3.9	56	..
4.16	62	13°
4.2	73	13°
4.16	80	13°
4.0	93	..
3.9	105	..
3.8	112	..
3.72	118	..

*Design angle.

No. 127 in a series by W. L. Nelson, professor of petroleum refinery engineering, University of Tulsa

JOHN ZINK . . .



PARTS LIST

Description	No.
Tile	CBM 10-0
Spider	B-6-0 C
Mounting Ring	CBM-1-0
Air Door	CBM-2-0
Front Plate	CBM-3-0
Streamlined Tee	M4-3
Aspirator Body	B-7-0
Aspirator Door	B-8-0
Aspirator Orifice Bushing	B-10-0
Air Door Handle	Z6
Oil Burner Body	Z99C
Oil Burner Steam Spud	Z90A
Oil Burner Guide	Z43C
Oil Burner Tip	9

6—Burner Size 9—Refer to Parts Order

DIMENSION LEGEND

Burner Size	A	B	C	D	E	F	G	H
CBM 14	18"	20⅜	22"	19"	33⅜	13⅜	20⅛	33
CBM 16	20"	22⅜	24"	19"	33⅜	13⅜	20⅛	33
CBM 18	22"	24⅜	26"	19"	33⅜	13⅜	20⅛	33
CBM 20	24"	26⅜	28"	19"	33⅜	13⅜	20⅛	34
CBM 24	28"	30⅜	32"	19"	33⅜	13⅜	20⅛	34

—FEATURES—

1—Gas or steam atomization of fuel oil or sludge.

2—Short flame at low excess air.

3—Low steam consumption.

4—Equal flow from all tip ports . . . uniform flame.

5—Vertical or horizontal firing.

6—Burns with either narrow or flared flame.

7—Gravity feed for moderate duty.

8—Easy to clean.

9—Extreme simplicity of design.

. . . . Series CMB BURNER

A Combination Gas and Oil Burner Featuring the Steamizer Type MTB Oil Gun

The John Zink BI-MIX GAS BURNER has been combined with a Steamizer type Oil Burner to produce a highly efficient COMBINATION oil and gas burner identified as Series CBM. It provides approximately the same heat pattern when firing either or both fuels in combination. Uses steam, high pressure gas or steam atomization.

Burns any properly prepared commercial grade of fuel oil, and any gaseous fuel at pressures in excess of 5 lbs.

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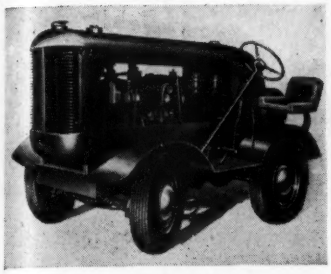
OIL AND GAS EQUIPMENT Digest

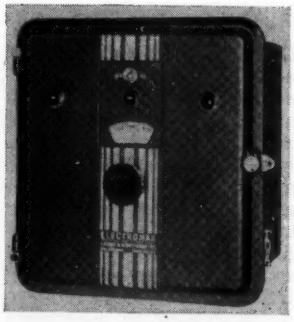
IT'S NEW CHECK IT

by John M. Spears



(1) SELF-PROPELLED TRAILER transports all portable power units. By mounting and adapting portable units to this trailer it immediately becomes self-propelled. A 30-m.p.h. speed may be attained, and mobility and service are comparable to a jeep. Adaptable to portable welding machines, air compressors, water pumps, light plants, etc. Will travel over all terrain including mud, sand, and slush. Available in two or four-wheel drive. Converts to marsh buggy by merely removing conventional-type wheels and installing pontoon-type wheels. Unit illustrated carries portable air compressor. *O. R. Smith Manufacturing Co.*

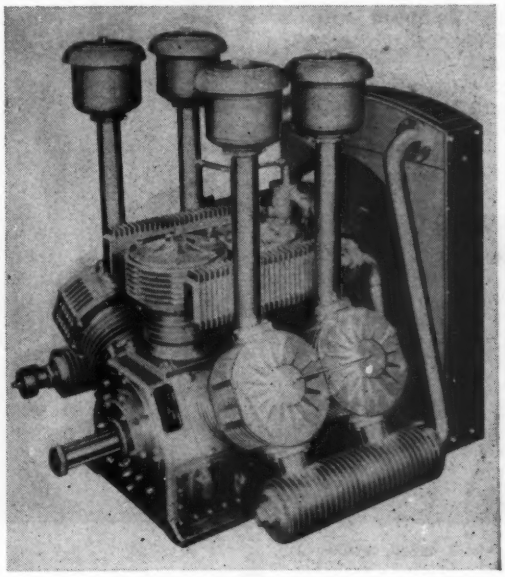
IT'S NEW CHECK IT



(2) TEMPERATURE CONTROLLER for those applications where indicating and recording are not required, signals and controls only, although temperature readings can be taken manually with it at any time. Instrument consists of a Wheatstone-bridge circuit with a vacuum-tube amplifier as the detector. Vacuum tubes are standard and require no matching, balancing, or other special selection. The lack of indicating or recording mechanism makes it require little maintenance. Temperature-sensitive elements are Thermohms, resistance thermometer bulbs. Standard ranges are 0° to 250° F. and 0° to 1,000° F. A-C operated. *Leeds & Northrup Co.*

IT'S NEW CHECK IT

(3) NEW PORTABLE COMPRESSOR includes five models of 60, 105, 160, 210, and 315 c.f.m. capacity. All units are of V-type cylinder design, except Model 315 (illustrated) which is of "W" construction with four low-pressure and two high-pressure cylinders. Units operate at relatively low piston speeds through use of short



piston strokes. Aluminum-alloy compressor heads and manifolds make possible cooler compressor operation and freedom from valve carbonizing. Other features include crankshaft mounting on heavy-duty double-row ball bearings, full-force feed lubrication, and individual air cleaners for each low-pressure cylinder. Models are available in skid, steel wheel, pneumatic-tired trailer, and flanged-wheel units. *Davey Compressor Co.*

IT'S NEW CHECK IT

(4) NEW MIDGET SPUDDER designed for hard-formation, island-exploration operations, has wide application where transportation difficulties are encountered. Com-

The Oil and Gas Equipment Digest presents a review of what is new in equipment and trade literature . . . makes it possible for readers to obtain full information on every subject by use of convenient "Check It—Mail It" service card. This periodic feature of The Oil and Gas Journal will include all that is new in equipment . . . at a time when new products are being introduced, and existing products improved.

Keep Informed. Save Time. Tear Out Card. Check It. Mail It.

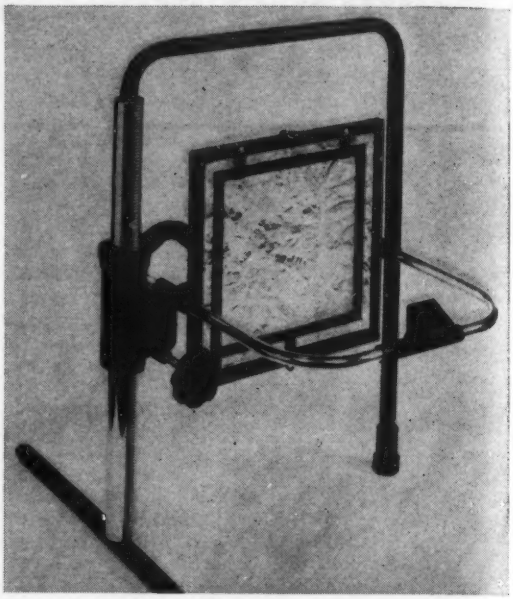
plete spudder weighs less than 2,400 lb. and is built in eight units weighing from 150 to 350 lb., readily assembled and bolted together. All parts are made of aluminum, except spudder frame, bell drum, engine, clutches, sprockets, chains, and bearings. Mast is 18 ft. high, with crown block equipped with rubber shock absorbers. Bull drum holds 500 ft. of ½-in. cable making it possible to drill to depths of several hundred feet. Standard steel cable tools for a 4½-in. hole are used. Equipped with a high-torque Onan engine. Dimensions at skids are: Width 5 ft. 3 in.; length 12 ft. 10 in. *Shaffer Manufacturing Co.*

IT'S NEW CHECK IT

(5) SPEED-LOK CHART HUB saves time in changing indicating charts. Fits tapered-arbor chart clocks, replacing two-piece hub. Consists of a single unit integral with the clock without loose parts to handle when changing charts. To make change, chart is placed on the hub and the knurled nut is turned to the right. Three hidden fingers appear to lock chart securely in the desired position without damage to center pole. A turn to the left of the knurled nut releases the chart. *American Recording Chart Co.*

IT'S NEW CHECK IT

(6) RECTOPLANIGRAPH provides a simple means of rectifying and transferring planimetric detail from aerial photographs to maps and charts used in geophysical interpretations. Based on the principle of the camera lucida, instrument is easy to use. Design includes indexed adjustments for three focal lengths (6, 8¼, and 12 in.), a micrometer adjustment for all variations in scale, and other adjustments for rectification of photographs to compensate for errors introduced by tip and tilt. A picture holder is fitted with masks to accommodate air photos ranging from 4 by 5 in. to 9 by 9 in.



Prism, used instead of half-silvered mirrors, assures a sharp, well-illuminated image. When all adjustments have been made, operator views photograph through peep sight and traces desired supplementary detail on map or chart by following image of lines from photo. *Fairchild Camera & Instrument Corp.*

IT'S NEW CHECK IT

(7) FLEET-ARC A.C. WELDER equipped with "arc booster" augments current the instant arc is struck. Arc is started automatically when electrode touches the work. A selector switch on front of welder governs amount of booster current to be used in striking the arc. This provides a complete range of striking intensity to suit requirements in welding thin sheets of heavy plates, making tack welds, or in using various types and sizes of electrodes. Current control, continuous and self adjusting, is provided by the rotating reactor control, which is held in position by cone brakes and is actuated by a self-cleaning chain drive. Thermostatic control, which opens the magnetic starter when overloaded, gives a high degree of self protection for the operator. *Lincoln Electric Co.*

IT'S NEW CHECK IT

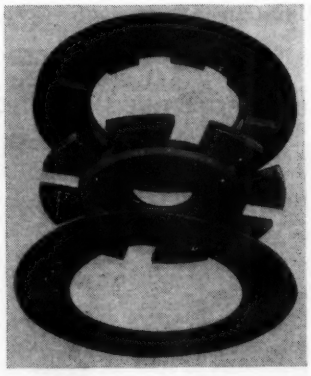
(8) PIPE-THICKNESS GAGE measures thickness of iron or steel pipes from outside. Applications include checking the safety factor of pipes and tubing carrying petroleum products, chemicals, steam, or gas. Consists of an indicating instrument, a gage head, and a saddle which

is connected to the gage head by two screws. To operate, saddle is placed on pipe, and thickness is indicated in

fractions of an inch on indicating instrument. Gage measures average thickness of pipe over an area of several square inches. Dirt, scale, and paint on inside of pipe do not add to thickness reading. Unit weighs 6½ lb. and operates on 115-volt, 60-cycle power. *General Electric Co.*

IT'S NEW CHECK IT

(9) NEW PIPE WIPER has replaceable core with a dovetail design which provides self locking. Three sections of wiper are held by eight nonsparking rivets. Cores can be replaced on rig floor without any special tools in a short time. Offset in inner portion of core provides a double-wiping surface. All-rubber construction. Sizes range from 12 to 19 in. o.d. and 6⅝ to 2⅜ in. i.d. *Target Equipment Co.*

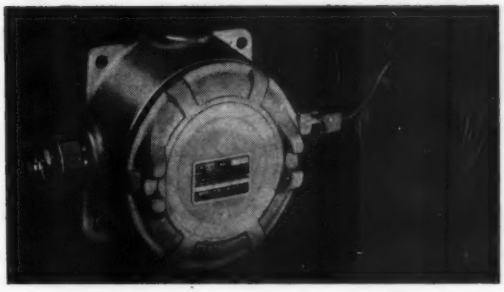


IT'S NEW CHECK IT

(10) TUBING BLOW-OUT PREVENTER and wire-line valve is adaptable to tubing jobs, inside cutting and fishing jobs, and running large-tubing calipers on measure lines. This 4-in., 10,000-lb. test preventer has pressure seal actuated by oil-resistant Hycar-rubber rams which seal around the wire line or tubing string. Rams are opened or closed by a 90° turn of ram arm, and can be changed simply by removing the top flange and taking out four studs. With "blind" rams it will close off around any size measuring line. Pipe rams accommodate tubing up to 2½-in. external upset. Valve weighs only 430 lb. and is small and compact. *Oilfield Machine & Supply Co.*

IT'S NEW CHECK IT

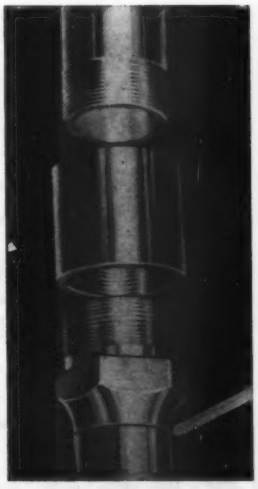
(11) REMOTE BULB THERMOSTAT has explosion-proof control for applications where dangerous dust and fumes are prevalent. All mechanism is located in an approved housing, the cover of which is threaded for easy removal



for inspection or maintenance. Has an external calibrated adjustment with 120° F. or 250° F. range in models covering —120° F. to 600° F. Four remote bulb styles are available. Electric ratings are: A.C. 1,200 watts, 115-230 volts noninductive; A.C. 300 watts, 115-230 volts, inductive. Suitable for pilot duty. *United Electric Controls Co.*

IT'S NEW CHECK IT

(12) NEW STAINLESS-STEEL FITTING adapts thin-walled stainless-steel tubing to piping installations where standard I.P.S. stainless pipe is used. New fitting overcomes obstacle encountered in putting pipe and tubing together. Adapter fitting permits use of stainless tubing in lighter takeoff systems from an already-established standard piping layout. Also makes practical the use of tubing in place of more costly standard stainless pipe in making installations where tubing would be equally suitable. Tubing is butt welded to adapter and thus is permanently fitted with standard pipe threads and can be assembled as any pipe. Enables dismantling for cleaning or inspection. *Electric Steel Foundry.*



IT'S NEW CHECK IT

TRADE LITERATURE

(13) PROCESS PUMPS. A 12-page, 2-color bulletin describes manufacturer's line of single-stage pumps for general service in refineries, processing plants, etc. Features pumps which will handle liquids at temperatures from below freezing to 800° F., with capacities up to 3,200 g.p.m. and in a wide range of material combinations to suit liquid being pumped. Cross-sections and photographs included. *Ingersoll-Rand Co.*

IT'S NEW ✓ CHECK IT

(14) FIREBRICK AND CLAY PRODUCTS SERVICE. Pamphlet describes the purpose and function of new organization for consultation and guidance in modernizing and improving the operations of refractory and allied clay product manufacturing. Gives itemized account of service features. *Engineering & Management Co.*

IT'S NEW ✓ CHECK IT

(15) CONSTRUCTION MACHINES. Multicolor, 27-page general catalog includes oil-field and associated equipment. Blocks and sheaves, wire-rope clips, hand-powered winches, hoists, and derricks are described and illustrated with field photographs. *American Hoist & Derrick Co.*

IT'S NEW ✓ CHECK IT

(16) GMX COMPRESSOR UNIT. A 4-color, 18-page bulletin covers gas-engine-driven compressor unit of V-angle design in lower-horsepower field. Stresses design features and their advantages. Photographs and two cross-section drawings with parts traced in colors included. *The Cooper-Bessemer Corp.*

IT'S NEW ✓ CHECK IT

(17) SILENT CHECK VALVE. New four-page bulletin describes flanged check valve used in refineries, pump lines, and chemical and power plants. Features dimensional details in tabular form and pictures illustrating specific installations. *The Williams Gage Co.*

IT'S NEW ✓ CHECK IT

(18) CHEMICAL SCALE REMOVAL. How chemistry and engineering are combined to restore efficiency to steam-generating equipment, condensers, piping, and all other mechanical facilities which are subjected to scale accumulations is described and illustrated in color booklet. *Dowell Incorporated.*

IT'S NEW ✓ CHECK IT

(19) RAMBLER RIG. Illustrated folder emphasizes speed over the road, speed in rigging up, and fast operation of trailer, truck, and skid-mounted rigs. May be used for gas, oil and water wells. Specifications and performance characteristics included. *International Derrick & Equipment Co.*

IT'S NEW ✓ CHECK IT

(20) ROD LINER PUMPS. Stationary-barrel rod sectional-liner pumps, traveling-barrel rod sectional-liner pumps, and traveling-barrel Champion pumps are described and illustrated in color in a full range of sizes, lengths, and types of assemblies for various depths and well conditions. Also includes weights, stroke data, standard and optional equipment, and recommendations for use. Booklet of 22 pages. *Emsco Derrick & Equipment Co.*

IT'S NEW ✓ CHECK IT

(21) WATER AND LIQUID CONDITIONING. New 60-page bulletin described the many different types of water-conditioning processes and explains applications, advantages, and limitations of each type. Included are tables listing the various kinds of gaseous and solid impurities, showing effects, limits of tolerance for various purposes, methods of removal, and residual amount of each impurity after treatment. Comparison chart indicates chemical results produced by various water-treatment methods. Three dozen illustrations show diagrammatically the principles of construction and operation of various processes and equipment for softening, clarification, and demineralizing of water and other liquids. *Liquid Conditioning Corp.*

IT'S NEW ✓ CHECK IT

(22) PLASTIC PACKINGS. Loose-leaf folder discusses various semimetallic plastic packings designed for the petroleum industry. Styles and description with recommended uses are given for each type. Features Style B-71 for sealing centrifugal, rotary, and reciprocating pumps, valves, etc., handling petroleum products and derivatives. Illustrated. *Durametallic Corp.*

IT'S NEW ✓ CHECK IT

(23) PROTECTIVE SYNTHETIC COATING. A four-page descriptive folder on "Ucilon" gives properties, application data, and typical uses of protective coating that resists corrosive conditions. Developed from inert, synthetic resins, material is used for maintenance work and for products subject to corrosive service. *United Chromium, Inc.*

IT'S NEW ✓ CHECK IT

(24) CONDENSER TUBES. Information on tube corrosion, selection of tube materials, composition and physical properties of tube alloys, installation methods, and specifications given in color brochure of 55 pages. Also includes methods of production, extension process, hot-piercing process, and complete data tables. *Scovill Manufacturing Co.*

IT'S NEW ✓ CHECK IT

The Oil and Gas Equipment Digest presents a review of what is new in equipment and trade literature . . . makes it possible for readers to obtain full information on every subject by use of convenient "Check It—Mail It" service card. This periodic feature of The Oil and Gas Journal will include all that is new in equipment . . . at a time when new products are being introduced, and existing products improved.

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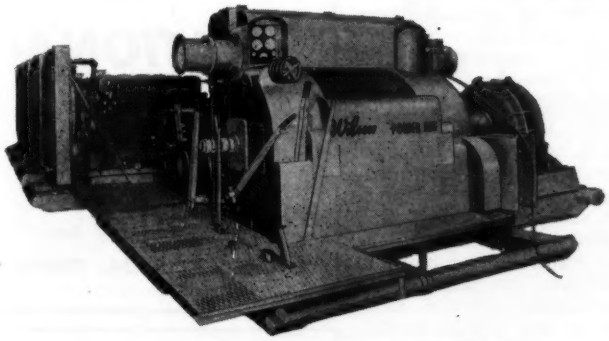
A WORLD OF Wilson RIGS

DOING A BETTER DRILLING JOB IN OVER 26 COUNTRIES



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Here's proof of the superiority of the Wilson Rig . . . it can be found in every active oil field . . . the world over! We are not surprised at their outstanding popularity, for Wilson Rigs have been engineered to do a better job. They are easy to operate . . . easy to repair . . . plenty of power and speed in coming out of the hole . . . enough power to drill in any formation and to any depth . . . and made to withstand the most gruelling treatment.

From shallow wells to the "yet-to-be-reached" depth of 20,000 feet, there's a Wilson Model that will do a better drilling job for you. Be sure to investigate the Wilson line of streamlined power rigs . . . NOW!

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"TRANSPARENT"
DROP FORGED STEEL
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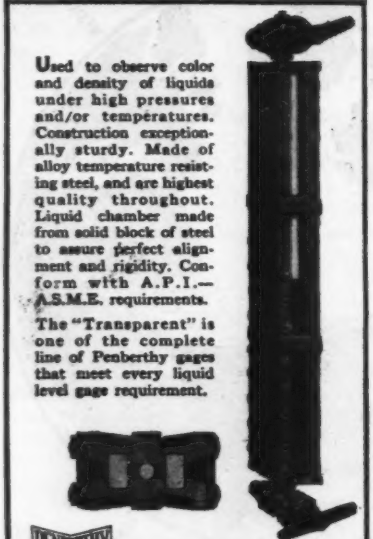
Used to observe color and density of liquids under high pressures and/or temperatures. Construction exceptionally sturdy. Made of alloy temperature resisting steel, and are highest quality throughout. Liquid chamber made from solid block of steel to assure perfect alignment and rigidity. Conform with A.P.I.—A.S.M.E. requirements.

The "Transparent" is one of the complete line of Penberthy gages that meet every liquid level gage requirement.



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REFINING

I.C.H.A.M. Liberalizes Viscosity Specifications

THE Oil Division of the Institute of Cooking and Heating Appliance Manufacturers has liberalized its specifications on kinematic viscosity for pot-type burner fuel, but the unchanged requirement on gravity was considered as still barring appreciable use of catalytically cracked material.

Dean Olds, chairman of the technical committee of the division, announced the specifications had been amended to extend the viscosity range from 1.9 minimum to 2.9 maximum at 77° F. The range in the specifications previously announced was 2.3 minimum to 2.9 maximum at 77° F.

A representative of midwestern refining interests said there is still serious objection to the 36 minimum gravity specification. He said many refiners feel there is no need for a gravity specification whatsoever and that it would not permit blending of much 26-32-gravity catalytically cracked material with 38-40-gravity burner fuel or 40-42-gravity kerosene.

The earlier specifications of the I.C.H.A.M. group met objections from refining interests on grounds they would rule out catalytically cracked material which is expected to be a major source of home-heating oil in coming years because of the present trend of refinery processing.

The I.C.H.A.M. announcement made it plain the manufacturers continued to favor straightrun fuel oils for their equipment. It said that, despite this preference, the specifications calling for "a stable distillate suitable for vaporizing pot-type burners" were approved, through recognition that any fuel made by any process would be acceptable providing it was treated or handled in a manner "which would give the burning characteristics of the straightrun product."

The announcement continued:

"The change in the viscosity limits is another move toward full agreement between oil refiners and manufacturers of vaporizing, pot-type oil-burning equipment and is regarded by the oil division as a real forward step in insuring proper fuel oil for the estimated 2,500,000 present users of pot-type space heaters, water heaters, floor furnaces, and circulating warm-air furnaces, for new users now being added at the rate of approximately 1,000,000 a year, and for fuel-oil dealers who are interested in supplying a type of oil that will give the most desirable results with a minimum of service requirements."

Olds reported that 60 per cent of the refiners responding accepted the original specifications without reservation and that another 28 per cent accepted with but a single reservation. Of this total of 88 per cent, he said it was found that nearly all the reservations were on the grounds that the limits of kinematic viscosity were too narrow.

The new specifications follow:

SPECIFICATIONS FOR FUEL OIL SUITABLE FOR VAPORIZING, POT-TYPE OIL BURNERS

(Approved December 1946 by Oil Division, Institute of Cooking and Heating Appliance Manufacturers)

A.P.I. gravity	36 minimum
Minimum flash, °F...	100 or legal
Viscosity, kinematic, 77° F.	1.9 min.-2.9 max.
Corrosion, 3 hours at 112° F.	Negative
Pour	0° F., maximum
Carbon residue on 10 per cent bottoms ..	0.10 maximum

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BURNING EQUIPMENT
NATIONAL
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1236 E. Sedgley Ave.
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LININGS FOR
BUBBLE TOWERS • SETTLERS • STILLS • SEPARATORS • TANKS • AND VESSELS OF ALL TYPES • ENCASING AND FIREPROOFING STRUCTURAL STEEL AND PIPE • LINING WATER RESERVOIRS, DITCHES, DRAINS AND CANALS • REPAIRING DISINTEGRATED CONCRETE AND OTHER MASONRY.
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District Branch Office: 228 N. LA SALLE, CHICAGO 1, ILL.
Branch Offices: ST. LOUIS, DENVER, DALLAS, NEW ORLEANS

Distillation range:	
10 per cent, °F.	420 maximum
F.b.p., °F.	625 maximum
B.s. and w.	Trace
Type of oil	Stable distillate suitable for vaporizing pot-type burners
Waxes, gums, other precipitated materials	Strainers, metering slots and orifices of standard controls must not become clogged upon prolonged use

Contracts Awarded for Carthage Hydrocol Plant

Contracts for the design, engineering, and construction of the $15,000,000 plant of Carthage Hydrocol, Inc., New York, have been awarded to Hydrocarbon Research, Inc., New York, and Arthur G. McKee & Co., Cleveland, according to Guy George Gabrielson, president.

The plant, to be built at Brownsville, Tex., will manufacture petroleum products and chemicals from natural gas, utilizing the Hydrocol process developed by Hydrocarbon Research, Inc. The research firm will provide the basic plant design and the McKee firm will serve as engineer-contractor.

Two Projects Groups Consolidated at Whiting

The light-oils projects group and the heavy-oils projects group of the Whiting, Ind., refinery of Standard Oil Co. (Ind.) are being consolidated into a new projects divisions, Dr. W. J. McGill, refinery manager, has announced.

Dr. R. T. Myrick, assistant to Dr. McGill, will direct the activities of the projects division, and Roy Diwoky will be superintendent. J. A. Rueff will be general foreman of light-oils projects, and P. C. Livesay will be general foreman of heavy-oils projects. The consolidation was effective January 13.

Also effective January 13, J. C. Ducommun, assistant general superintendent of the Whiting refinery, was reassigned to executive work in connection with plant management; Charles F. Smith became assistant superintendent of the light-oils division; and G. H. Jones was made general foreman of the catalytic-cracking department.

Stanolind Synthol Plant Now in Engineering Stage

Engineering work now is under way on the proposed commercial-scale Synthol plant of Stanolind Oil & Gas Co., to be built in the Hugoton field in southwestern Kansas, the company announced last week.

Figures disclosed with the announcement indicated the company expects to obtain a yield of 2.52 gal. of high-quality gasoline and 0.42 gal. of distillate fuels from each 1,000 cu. ft. of natural gas processed. The plant is being designed to process about 100,000,000 cu. ft. daily of low-heating-value gas currently considered unsuitable for sale as fuel.

An extensive pipe-line gathering system and a natural-gasoline plant will be installed to provide the necessary volume of dry feed gas. In the process, feed gas is burned under a pressure of 300 psi. with relatively pure oxygen to yield synthesis gas with a closely controlled composition.

The company announcement estimated a yield of 1 bbl. of crude synthetic oil and "substantial amounts" of oxygenated compounds from each 15,000 cu. ft. of gas charged to the plant. Recovery and treatment of the hydrocarbon products for market will be accomplished by conventional refinery methods.

Socony-Vacuum Awards Paulsboro Contract

Contract has been awarded by Socony-Vacuum Oil Co., Inc., to Catalytic Construction Co., Philadelphia, for catalyst changes in its six-case Houdry fixed-bed unit at Paulsboro, N. J.

Contract for the work was based on a fixed price quoted by Catalytic Construction Co. Work has already begun, and it is estimated that it will be completed in 6 weeks, officials of the construction company said.

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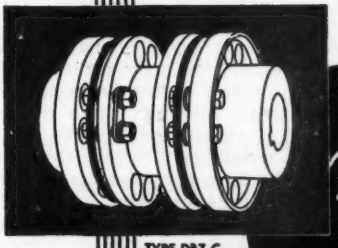
Flexible COUPLINGS
FOR HOT OIL PUMP DRIVES or any other service where 100% dependability is demanded



THOMAS Flexible COUPLINGS provide for Angular and Parallel Misalignment as well as Free End Float . . . and Eliminate BACKLASH, FRICTION, WEAR and CROSS-PULL
NO LUBRICATION IS REQUIRED!

The Thomas All-Metal Coupling does not depend on springs, gears, rubber or grids to drive. All power is transmitted by direct pull.

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WARREN, PENNSYLVANIA

When you give Pipe Line Service a job of coating and wrapping pipe, you have the close cooperation that you'd expect only from a department of your own, without any of the headaches of equipment and personnel.

These experienced pipe protection specialists offer you a complete service at six strategically located plants that relieves you of all responsibility. You simply select the specification you want and Pipe Line Service does the rest.

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PIPE LINES

Hull to Leave for Arabia Early in February

BURT E. HULL, president, Texas Pipe Line Co., will sail from New York, February 5, on the "Queen Elizabeth" for England. From there he will take a plane for Arabia where he will travel along the route of the 1,050-mile 28-in. and 30-in. line to be constructed for Trans-Arabian Pipe Line Co.

With him on this reconnaissance trip there will be Hubert H. Hall, vice president, San Francisco, and William J. Linehan, general Middle East agent, Beirut, of Trans-Arabian Pipe Line Co.; William R. Chandler, engineer, San Francisco; and J. L. Culbertson, engineer, Tulsa.

It has not been decided whether the point of departure for the trip along the route will be in Palestine or Arabia. The objective is to reconnoiter and break ground for the survey of the pipe-line route, etc. There are no records of the route being traveled on the ground. However, several aerial surveys have been made. For 900 miles the region is inhabited by only a few Bedouins living in tents. Although there are no roads, it is anticipated that the party can travel most of the route by automobile. Radio communication will be vital for the effectiveness of the tour.

In April a party consisting of 30 or 40 men headed by William C. Seal, engineer, loaned to Trans-Arabian by Standard Oil Co. of Texas, will survey the route on the ground. Some road building equipment will be taken by the party to break the trail. Two or three parties will be added for this survey which will probably be in progress until the end of 1947.

Pipe for the project is expected to arrive late in 1948, and construction will mostly be carried on in 1949 with the object of finishing the job on or before January 1, 1950. This means that the project will be 2 years in the preparatory stage and 1 year under construction. Approximately two-thirds of the line will be laid on top of the ground. There will be six pump stations, 175 miles apart, which will move 300,000-330,000 bbl. daily.

Tax Receipts Down

WASHINGTON. — Receipts of the federal tax on transportation of oil by pipe line dropped from $1,281,887.28 in November 1945 to $1,211,691.40 in November 1946, a decline of about 5½ per cent, according to figures released by the Bureau of Internal Revenue.

Stanolind Lets 178 Miles Of 20-In. Loops

Stanolind Pipe Line Co. let contracts last week for the laying of 178.16 miles of 20-in. for looping divided into four jobs.

Job 1 consisting of two loops totaling 44.94 miles between Drumright and Blake stations, Oklahoma, was let to Midwestern Constructors; Job 2, 45.88 miles, and Job 3, 47.53 miles, between Blake station and Centerville, Kansas, to Ray L. Smith Construction Co.; and Job 4, 39.81 miles between Centerville and Freeman, Mo., to Oklahoma Contracting Co. The first pipe is scheduled to arrive February 15 but there is a possibility that some pipe may reach the project February 2.

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Shell Negotiating for Pipe Line Right-of-Way

HOUSTON.—Negotiations are now under way by Shell Pipe Line Corp. officials for right-of-way for the company's proposed pipe line from its Sheridan recycling plant in Colorado County to its refinery at Deer Park on the Houston ship channel.

The company has announced plans to begin construction on the line in February. The 6-in. line will reach a distance of about 100 miles and is expected to cost $1,240,000.

Inductance-Bridge Flaw Detection Described

WASHINGTON.—A new report from the Office of Technical Services, Department of Commerce, describes a method of finding and measuring flaws in ferromagnetic tubes and pipes with an alternating-current inductance bridge.

This method, the O.T.S. said, was developed at the Watertown (Mass.) Arsenal during the war to facilitate the detection of defects in inaccessible bore surfaces of gun tubes. The report was written by Sgt. Carlton H. Hastings, Army Ordnance Department. The inductance bridge is coupled to an indicator through an amplifier. One inductance coil is used as a pick-up or detecting coil and the other as an identical compensating coil. The metal being tested is magnetized with a very weak direct current. Flaws, located by scanning the surface of the metal with the pick-up coil, upset the balance of the bridge and cause the indicator to twitch rapidly, according to the report. The report is available, photostat or microfilm, for $1.

Stanolind Building New Oklahoma Pump Station

OKLAHOMA CITY.—Construction is under way near here by Stanolind Pipe Line Co. of a 2,000-hp. pump station on its West Texas-Drumright oil pipe line. The station is being built on a site 2½ miles east of El Reno and is expected to be in operation by March 1.

New homes for workmen also will be built in the area. Oklahoma Gas & Electric Co. which will supply power to the new station, plans to build a substation near the plant.

Laderwig Is Successor to J. W. France, Contractor

Laderwig Engineering Co., Corpus Christi, Tex., has been organized to succeed J. W. France Co., pipe line contracting firm which is now in the process of liquidation. Officers of the Laderwig company include Herman Laderwig, president; Smith Davis, George Ralston, A. C. Breitung, and Robert H. Martin.

Hope Natural's $4,552,000 Program Approved by FPC

WASHINGTON.—The Federal Power Commission has authorized Hope Natural Gas Co., Clarksburg, W. Va., to construct and operate additional natural-gas transmission facilities in West Virginia at an estimated construction cost of $4,552,000.

Proposed facilities include three 800-hp. compressor units at the Oscar Nelson compressor station in Wyoming County, two 800-hp. compressor units at the Loup Creek compressor station, also in Wyoming County, two 1,200-hp. compressor units at Jones compressor station in Gilmer County, two 2,000-hp. compressor units and one new boiler with 125,000-lb./hr. capacity at Hastings compressor station in Wetzel County, and an aggregate of 58 miles of 20-in. loop line paralleling existing main lines connecting four compressor stations.

These facilities will be constructed and operated as integral parts of Hope's pipe-line system in order to compress and transport additional volumes of gas for the maintenance of service to existing wholesale and retail customers.

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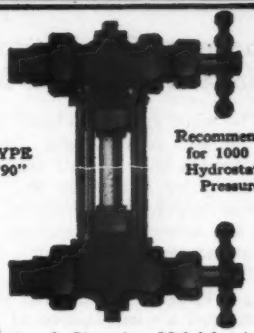

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NATURAL GAS

Cheyenne Gas Shortage Brings Connections Ban

The shortage of natural gas faced by many natural-gas distributing companies this winter was reflected in an order issued by the Wyoming Public Service Commission prohibiting any new gas connections in Cheyenne and vicinity until after March 15.

The order applies to Cheyenne Light, Fuel & Power Co., which encountered a near failure of gas service December 28 as a result of extremely heavy demand during a cold wave.

Only exception under the commission's order was homes under construction and designed for gas heating only. The gas company said it would send letters to heating contractors that the company cannot serve new installations at the present time.

Plans for the construction of a new 102-mile gas line from Denver to Cheyenne have been announced. The line will be built by Colorado-Wyoming Gas Co., owners of the present line, at a cost of about $1,500,000, while the Cheyenne power company will spend an additional $300,000 making local connections and distribution improvements. (The Oil and Gas Journal, January 11, page 92).

Hugh Lenhart, manager of the Cheyenne company, said a 30 per cent increase in demand along the entire pipe-line system had taxed it to capacity. He said the number of new customers in Cheyenne during the last year had increased 21 per cent, with the greatest number added during the time of the coal strike.

Members of the Wyoming commission, explaining the order, said the purpose was to protect present gas consumers since unrestricted connections to the mains would further jeopardize service to existing consumers.

Senyard Named Chairman Of A.G.A. Conference

W. H. Senyard, personnel director, Louisiana Power & Light Co., New Orleans, was elected chairman of the Southwest Personnel Conference of the American Gas Association in a recent mail vote of the conference group.

He succeeds H. D. Carmouche, superintendent of pipe lines, Houston Pipe Line Co. Other new officers are Willard G. Weigel, personnel director, Lone Star Gas Co., Dallas, vice chairman, and R. S. Collings, United Gas Corp., Houston, secretary.

Appeal Bonds Fixed in Oklahoma Price Order

The Oklahoma Corporation Commission has fixed bonds totaling more than $400,000 covering performance by a number of natural-gas purchasers companies while a court appeal is taken from the commission's order setting a 7-cent per 1,000 cu. ft. price for gas from Guymon-Hugoton field in the Oklahoma Panhandle.

The commission took its unprecedented price-fixing action several months ago, holding that the present price of about 4½ cents constitutes economic waste. The order was given in a case filed against Cities Service Gas Co. by Peerless Oil & Gas Co., a producer.

The bond for Cities Service Gas was set at $250,000. For seven other purchasers, bonds ranged from $2,000 to $64,000. The bonds cover a period of 1 year, and the commission retained jurisdiction so that they may be extended if the Oklahoma Supreme Court has not taken final action by the end of that time.

Natural Gasoline

Electronic-Type Indicator Described Before C.N.G.A.

The development of an electronic-type indicator suitable for use on high-speed, high-pressure compressors was described at a recent meeting of the California Natural Gasoline Association by Barclay Thomson and Henry Curtis, of Fluor Corp.

Thomson, who presented the paper, said the indicator can be quickly installed, is capable of following the movement of the piston without inertia effects, and can follow pressure changes whose frequencies are between zero and 30,000 cycles per minute.

The technique of coking operations was explained in another paper by Randall Maass and R. S. Lauterbach, of General Petroleum Corp. Maass told the group heavy demands for diesel fuel and stove oil are forcing refiners to a more extensive cracking of residuum fractions.

Automatic control of light hydrocarbon-processing equipment producing closely fractionated products will be discussed at the February meeting of the association of E. H. Reynolds, William Troutman, and Gordon Lawn, of Richfield Oil Corp. The meeting will be held February 6 at Rio Hondo Golf Club.

Bureau Report Shows War Trends in L.P.G. Use

Industry figures showing that sales of liquefied petroleum gas again mounted to a new high in 1945 were confirmed by a recently issued Bureau of Mines report listing sales for that year at a total of 1,276,776,000 gal.

The bureau report discussed consumption and end use of L.P.G. in the last war year and pointed out the proportionate share of butane in annual sales of L.P.G. dropped steadily during the war principally because of the diversion of large quantities to synthetic rubber manufacture.

The total sales in 1945 represented an increase of 20.4 per cent over 1944, contrasted to an increase of 33 per cent from 1943 to 1944. Butane, excluding that used as a synthetic-rubber component, represented less than 14 per cent of the sales total in 1944 and 1945 against 24 per cent in 1941.

An industry report issued several weeks ago placed marketed production of L.P.G. in 1945 at 1,067,979,000 gal. and in 1946 at 1,425,000,000. These figures were included in the annual report of L.P.G. sales prepared by G. G. Oberfell and R. W. Thomas, Phillips Petroleum Co. (The Oil and Gas Journal, December 28, page 146).

The Bureau of Mines said fuel users of butane shifted during 1945 and earlier war years to propane and butane-propane mixtures. Relative quantity of propane in sales rose from 26 per cent in 1942 to 39 per cent in 1945.

Use of L.P.G. mixtures as fuel for internal-combustion engines was limited by competition for the material from fuel and chemical consumers, the bureau report said. The percentage of mixtures dropped from 50 per cent of total sales in 1944 to 47 per cent in 1945.

Butane Law Passed

A new city ordinance regulating the handling of butane gas has been passed by the Sherman, Tex., city commission. The law prohibits storage of gas in the city limits and specifies methods of handling and transporting the product.

Exploration and Drilling

Rocky Mountain Off to Good Start

THE exploration campaign for 1947 in the Rocky Mountain area is starting under very favorable conditions, with several promising wildcats to offer encouragement.

Operators of the Elk Basin Unit have decided to wait for developments in two flank tests to the Madison lime before making any permanent plans. The discovery well, on the crest of the structure, is a good well from the lower 300 ft. of pay, with an equal footage of better-looking upper pay cased off.

Another inner-basin discovery is looming on the Neiber Dome, in Washakie County, Wyoming, near the southern part of the Big Horn basin. G. & G. Drilling Co. 1 Government, SE NE NW 19-45n-92w, 18 miles south of River Dome, where Pure Oil Co. had the first inner-basin strike, picked up top of the Embar at 10,025 ft., Tensleep at 10,270 ft., Amsden at 10,437 ft., Madison lime at 10,736 ft., and drilled to total depth of 10,980 ft. With 7-in. casing set at 10,189 ft., and perforated at 10,025-55 ft., and 10,070-95 ft., opposite the Embar, it blew gas and sprayed oil. When connected to the flow line it made 30 bbl. of oil in 5 hours, then died, and it was found that the expansion of the heavy gas flow had frozen the tubing a few hundred feet below the surface, a condition also found by Pure at River Dome. The Embar oil recovered is about 40° gravity.

Down in southwestern Colorado, operators were waiting for T. C. Hudson to run casing and test his 1 Schmidt, NW NE 36-34n-12w, Red Mesa district, La Plata County. This well had a good show of oil at 2,995 ft. in the Tocito sand member of the Mancos shale, but as the hole was caving badly, the well will be cased before further testing. The objective of the well is Dakota, expected around 3,400-3,500 ft.

South, and across the line in northwestern New Mexico, another inner-basin test of the San Juan basin, English and Byrd-Frost 1 Government, NW SW 4-27n-10w, San Juan County, is waiting on casing to be run before making production test of the Dakota, topped at 6,475 ft., and cored with recovery of bleeding and dripping cores.

N. CENTRAL TEXAS

Operations Resumed at Shackelford County Test

WICHITA FALLS.—Warmer weather allowed operations to be resumed at Central Pipe Line Co.'s wildcat in Block 583, T&EL Survey, near Albany, in Shackelford County. Before the holiday shutdown, casing was set at 4,535 ft., after topping the Ellenburger at 4,531 ft. Samples were said to have showed favorable signs of oil, and with the installation of cable tools, the well will be swabbed for a test. Mississippi limestone at 4,421-57 ft. was reported to have shown oil, and a 90-minute drill-stem test of this section recovered 680 ft. of oil-cut mud.

In western Collin County, near the town of Frisco, Standard Oil Co. of Texas 1 T. W. Newsome reported oil showings at 6,660-71 ft., recovering 7 ft. of hard, tight sand showing oil in a core from 6,671-78 ft. A drill-stem test at 6,658-78 ft. failed and operator then drilled out to 6,682 ft., where a second drill-stem test failed. Additional shows of oil were found from 6,682-6,711 ft., and when a test of this section failed, operators pulled the tester to run an electric survey.

In Montague County, Continental Oil Co.'s wildcat, the 1 S. T. Tompkins, 6 miles southeast of Montague, made a drill-stem test at 6,904-14 ft. and in 90 minutes recovered 115 ft. of gas-cut mud and 20 ft. of heavily oil-cut mud. Bottom-hole pressure was 650 lb. It was drilling ahead below 6,965 ft. in shale and limestone on last report.

NORTH TEXAS SUCCESSFUL WILDCAT

Young County: H. W. Snowden Oil & Gas Co. 1 G. O. Hazelton, Sec. 1,995, TE&L Co., Sur., ½ mi. NE Loving, elev. 1,272 ft., pumped 84 bbl. of 42.8°-gravity oil, sand 3,373-75 ft., TD 3,375 ft.

NORTH TEXAS WILDCAT FAILURES

Cooke County: W. M. Dannenberg 1 G. O. Breeding, A. D. Kendall Sur., 5 mi. SE Woodbine, dry, TD 4,505 ft., Arbuckle 4,395 ft.

Montague County: Lesh & McCall 1 R. W. Cunningham "D," Griffin Payne Sur., 10 mi. NE Nocona, elev. 879 ft., dry, TD 2,875 ft., pre-Cambrian 2,870 ft.

WEST CENTRAL TEXAS WILDCAT FAILURES

Callahan County: H. F. Pettigrew 31 Pippin, Sec. 3,158, TE&L Sur., 3½ mi. NE Putnam, dry, TD 1,020 ft.

Taylor County: B. H. Hilburn et al 1 Leslie N. Brown, Jose Gabo Sur., 7 mi. NE Merkel, dry, TD 2,708 ft. in limestone, Hope limestone 2,440 ft., Swastika 2,680 ft.

Haskell County: T. D. Humphrey 1 L. Scruggs, Sec. 3, MEP&P Sur., 1 mi. N. Stamford, elev. 1,561 ft., dry, TD 4,509 ft., Saddle Creek 2,050 ft., Flippen 2,140 ft., Palo Pinto 3,780 ft., Strawn 3,880 ft.

Jones County: Wofford Cain 1 Stephenson, Sec. 4, Blk. 16, T&L Sur., 4 mi. SW Hawley, elev. 1,706 ft., dry, TD 2,208 ft., Noodle Creek 1,924 ft.

Hugh G. White 1 A. C. Humphrey, Sec. 45, Dumb Asylum Lands, 4 mi. SW Avoca, elev. 1,637 ft., Dotham 1,625 ft., Saddle Creek 1,930 ft.

Shackelford County: Dean Bros. 2 Newell "M," Sec. 4, GH&H Sur., 8 mi. W Albany, dry, TD 1,530 ft.

Standard Oil Co. of Kansas 1-D W. H. Green, Sec. 68, Blk. 12, T&P Sur., 13 mi. SW Albany, elev. 1,812 ft., dry, TD 5,005 ft., Palo Pinto 2,832 ft., Strawn 3,050 ft., Caddo 4,242 ft., Ellenburger 4,800 ft.

Stephens County: Tom Palmer 1 Ford, D. D. Wright Sur., 5 mi. NE Ivan, dry, TD 4,382 ft.

Taylor County: Alder Oil Co. 1 J. Kenny, Grimes CSL Sur., 3 mi. SE Merkel, elev. 1,836 ft., dry, TD 3,030 ft., Dotham 2,086 ft., Reef 2,935 ft.

Hedrick Oil Co. 1 W. C. Lee, Grimes CSL Sur., 3 mi. NE Merkel, elev. 1,839 ft., dry, TD 2,797 ft., Flippen 2,488 ft., Gunsight 2,790 ft.

EASTERN TEXAS

Weather Continues to Slow Eastern Texas Operations

DALLAS.—East Texas operations were slowed last week by rainy weather. This condition plus the material shortage had drilling operations at a low ebb. In Freestone County, The Texas Co. 1 White, a deep wildcat near Fairfield in King Survey, was coring below 13,330 ft. on last report. A good showing of gas in the Cotton Valley at 11,286-11,332 ft. was reported, and top of the Buckner was tentatively placed at 11,943 ft.

Standard Oil Co. of Kansas' Houston County test, located some 5 miles west and north of Porter Springs, released information on drill-stem tests in the Woodbine which was placed at 7,166 ft., on an elevation of 259 ft. The first test at 7,184-96 ft. returned the 1,750-ft. water cushion and 60 ft. of gas-cut mud in 40 minutes. A second test, open 1 hour, at 7,184-208 ft. recovered 100 ft. of slightly gas-cut mud, while the third test at 7,214-38 ft. recovered only salt water. Operators were last reported drilling ahead below 7,300 ft. in sand and shale, and apparently due to test the Edwards limestone.

EAST TEXAS SUCCESSFUL WILDCAT

Leon County: Daniel Oil Co. 1 F. A. Cox, John Scritchfield Sur., 4 mi. SE Flynn, elev. 424 ft., flowed 72.5 bbl. 33°-gravity oil in 24 hours through ¼-in. tubing choke, Woodbine 7,100-7,404 ft., TD 7,447 ft., tubing pressure 100 lb.

EAST TEXAS WILDCAT FAILURES

Angelina County: D. H. Byrd 1 Angelina County Lumber Co., Jesus De La Garza Sur., 3 mi. S Wells, elev. 350 ft., dry, TD 7,515 ft., Wilcox 1,099 ft., Midway 3,906 ft., Woodbine 6,514 ft.

Franklin County: Humble Oil & Refining Co. 1 A. Jaggears, J. Humphries Sur., 1½ mi. W Winfield, elev. 432 ft., dry, TD 7,455 ft., Blossom 2,656 ft., sub-

Clarksville 3,250 ft., Glen Rose 5,590 ft., Massive 6,510 ft., Travis Peak 7,250 ft.

Navarro County: C. P. Porter 1 Goldman, Michael Shire Sur., 2 mi. N Angues, dry, TD 1,631 ft., may be deepened to Woodbine.

APPALACHIAN FIELD

Warren County Test Disappointing

PITTSBURGH.—In Sugar Grove Township, Warren County, Pettigrew et al deepened No. 1 Anderson below the Oriskany sand and at 3,974 ft. water broke in, rising 3,200 ft. in the hole. Logged were the Tully Lime 2,833-59 ft., Onondaga 3,046-3,183 ft., Oriskany 3,183-3,216 ft.

In Allegheny Township, Westmoreland County, Apollo Gas Co. completed its J. J. Knappenberger test with a final gage turned into the line of 984,000 cu. ft. from the Speechley sand topped at 2,842 ft., gas 2,857 ft., total depth 2,857 ft.

New locations totaled four, one in Armstrong County, and three in Greene County.

In Ripley district, Jackson County, West Virginia, Godfrey L. Cabot, Inc., completed 1,211 Putnam Co. good for 1,715,000 cu. ft. gas after shot. Surface elevation is 942 ft., Corniferous lime 5,084 ft., Oriskany 5,178-5,215 ft., gas 5,186 ft., shot 5,185-5,205 ft., total depth 5,231 ft.

In Reedy district, Wirt County, the top of the Corniferous Lime in the United Carbon Co. wildcat on A. Carter Smith farm has been corrected to 5,392 ft. from the surface elevation of 830 ft. It has been cased and drilling resumed. In South West district, Doddridge County, P. & M. Oil Co. completed 2 Jessie Williams with a final gage of 687,000 cu. ft. from the Salt sand, total depth 1,344 ft.

In Huff Creek district, Wyoming County, Godfrey L. Cabot, Inc., completed 1,210 John Gilbert, Jr., good for 730,000 cu. ft. gas, elevation 2,237 ft., Big Lime 3,305 ft., Injun 3,722-95 ft., Berea 4,379 ft., gas 4,407-14 ft., total depth 4,414 ft. In Slab Fork district, Owens Libby Owens Gas Department shut down the Oriskany wildcat 745 Western Pocohontas Co. at 6,784 ft. in the Helderberg Lime. The Oriskany, 6,672-85 ft., was dry.

LA.-ARK.

Waskom Gas Field Extended Into Caddo Parish

SHREVEPORT.—A southeast extension of the Waskom wet gas field into Caddo Parish was indicated last week at Stanolind Oil & Gas Co. 1 Fred Wappler, in Section 20-17n-16w, about 2 miles southwest of Greenwood. Top of the Travis Peak was logged around 5,900 ft., and cores at 6,060-6,100 ft. recovered gas sand. A drill-stem test at 6,060-6,115 ft., open 5 minutes, returned a good show of gas, and condensate-cut mud. No estimate was given on the amount of gas. A show of dry gas, with no oil, was also found in the Pettit zone at 5,630-70 ft. Total depth of the well is 6,218 ft.

The 1 Wappler is the second test to be completed on the Louisiana side of the Waskom area, being some 3 miles southeast of Arkansas Fuel Co. 1 Bell. Location is approximately 2 miles from the present defined limits of the Waskom field and operators had hoped the test might find crude production in the Travis Peak as some of the field's edge wells have done. Successful completion of the 1 Wappler will not only mean an extension to the field, but will probably open a considerable area to new development.

NORTH LOUISIANA WILDCAT FAILURES

Bossier Parish: W. K. Rowe 1 Hardy, approx. C 10-23n-13w, elev. 301 ft., dry, TD 3,513 ft., Midway 1,020 ft., Nacadoch 1,787 ft., Annona 2,520 ft., Tokio 3,045 ft.

Caddo Parish: Atlas Oil & Refining Co. 1 S. G. Sample, SW NW 29-17n-14w, dry, TD 3,514 ft., no shows.

Claiborne Parish: Union Production Co. 1 Wise, NW NE 15-23n-6w, dry, TD 5,710 ft., Massive 3,925-4,124 ft., Travis Peak 5,284 ft.

ARKANSAS WILDCAT FAILURES

Little River County: R. A. Mason 1 Hulitt Troth, NE SW 3-14s-28w, dry, TD 3,506 ft., no tops reported.

R. W. O'Meara 1 Ed Woods, SW NW SE 7-14s-28w, elev. 85 ft., dry, TD 5,658 ft., Paluxy 1,947 ft., Massive 3,100 ft., James 3,563 ft., Travis Peak 3,753 ft., Cotton Valley 4,485 ft., Smackover 5,262 ft.

Miller County: C. M. Kerns 1 Lincoln National Life Ins., NE NW 15-18s-26w, dry, TD 5,805 ft., Massive 5,550-5,663 ft., elev. 217 ft.

Union County: L. H. Wentz 1 Futrell, SW NW 1-17s-17w, dry, TD 3,100 ft.

SOUTHWEST TEXAS

New Gas Field Discovered North of La Rosa Field

CORPUS CHRISTI.—A new gas-producing area has been opened by the Clymore Co., Inc. 1 John L. Zarsky, wildcat 1 mile mile north of the La Rosa field, Refugio County, in J. M. Aldrete Grant. Drilled to a total depth of 7,035 ft., this new discovery gaged 50,000,000 cu. ft. of gas per day on open flow, and flowed 1,515,000 cu. ft. gas per day through a 3/16-in. choke. Tubing pressure was 1,870 lb., with shut-in pressure of 1,930 lb., and no water in the flow.

J. O. Clark 1 M. G. de Juarez, new extension producer in the South Kelsey area of northeastern Starr County, has been dual-completed to open two new oil pay zones for this field. This well flowed 124 bbl. of 42°-gravity oil per day through a 9/64-in. choke through perforations at 5,871-76 ft. in sand topped at 5,869 ft. On the dual-completion it came in for 144 bbl. oil per day through a 9/64-in. choke through the casing with perforations at 5,369-72 ft. in sand topped at 5,364 ft. This well also tested oil in the discovery pay at 5,702-23 ft., and logged gas sand at 5,297-5,318 ft., and oil and gas sand at 5,533-41 ft. It is located in the Santa Teresa Grant.

The Texas Co. 38 H. C. de Tijerina, in the area between the original Tijerina field production and the Seeligson field, in A. Canales Survey 360, has opened Zone 17-B as a new producing sand for the Tijerina-Canales field. Total depth is 7,472 ft., and initial production is 73 bbl. of oil per day through 5/32-in. choke, with perforations at 5,990-6,000 ft. Gas-oil ratio was 502 to 1, tubing pressure 210 lb., casing sealed.

The Tom O'Connor field in Refugio County led in the number of new locations reported with 22, while Luling field in Caldwell County showed 6. The 28 completions are 17 oil wells, including 1 discovery in Starr County, 2 gas wells, 1 a new pool opener in Refugio County, and 9 dry holes of which 4 are wildcats, 1 each in Duval, Karnes, McMullen, and Webb counties.

SOUTHWEST TEXAS SUCCESSFUL WILDCATS

Refugio County: New gas pool—The Clymore Co., Inc. 1 John L. Zarsky, in La Rosa area in J. M. Aldrete Grant, 1 mi. N of La Rosa field and 3½ mi. S of Woodsboro, top pay 4,926 ft., TD 7,035 ft., perf. 4,926-37 ft., IP 50,000,000 cu. ft. gas on open flow, flowed 1,515,000 cu. ft. gas per day through 3/16-in. choke, TP 1,870 lb., SIP 1,930 lb., no water.

Starr County: New oil pool—V. F. Neuhaus 1 Loreto Canales, 23 mi. N of Roma, in Share 2, Parcel "B" Sacatosa Grant (originally Geo. R. Boyle 1 Canales dry hole, abandoned in 1945), OTD 1,602 ft., new TD 1,715 ft., top pay 1,700 ft., perf. 1,707-14 ft., IP 2 bbl. oil per day on pump, no gas, gravity 42°, no water.

SOUTHWEST TEXAS WILDCAT FAILURES

Duvas County: H. H Howell 1 Schallert, SM&S Sur. 255, on NW flank of Palangana Salt Dome, dry, TD 5,040 ft.

Karnes County: Southern Minerals Corp. 1 T. Pawlik, Fernando Carillo Sur., 7 mi. NE of Falls City, dry, TD 6,210 ft.

McMullen County: Henshaw Bros. and E. H. Smith 1-B Nueces Land & Cattle Co., BS&F Sur. 169, 2 mi. NE of Munson field, dry, TD 2,020 ft.

Webb County: E. H. Stickney 1 Rosa V. de Benavides et al, Sur. 1,088, 4 mi. NW of Bruni, dry, TD 3,106 ft.

PERMIAN BASIN

TXL Extension Well Has Large Initial Potential

MIDLAND.—Rowan Drilling Co.'s extension well at TXL, Ector County, last week made a potential of 2,154 bbl. of oil, without acidization. The oil tested 44.8° gravity and the flow was through ½-in. tubing choke from open hole at top of the Ellenburger at 9,623 ft., to total depth of 9,719 ft. Gas-oil ratio was 852 to 1.

An application for a Devonian test on the north side of TXL was filed last week by Mid-Continent Petroleum Corp. The project will be the 1-N TXL, Section 21, Block 46, TP Survey, and is some 3½ miles north and slightly west of nearest production in the field, and is just inside the northeast corner lines of Winkler County. It is scheduled to drill to 8,800 ft.

In southwestern Andrews County, Shell Oil Co., Inc., and The Texas Co. 4 Ratliff & Bedford, was a southwest extension to the Bedford pool. Initial potential of 639 bbl. of 44.6°-gravity oil, with gas-oil ratio of 410 to 1, was from the Ellenburger. Top of the pay was not reported, but flow was through ¼-in. tubing choke from open hole, with total depth at 11,324 ft. Commercial production was also found in the Devonian and it was expected to be completed from both zones, making it the third dual completion in the field.

In Terrell County, R. E. Freeman No. 1, a wildcat in Section 50, Block A-2, GH&SA Survey, is drilling at 1,326 ft. in sandy lime with some signs of staining and slight gas shows.

WEST TEXAS WILDCAT FAILURES

Cochran County: Stanolind Oil & Gas Co. 1-C Slaughter Wright, Brewster CSL Sur., 6½ mi. W Whiteface, elev. 3,771 ft., dry, TD 7,003 ft., Yates 2,780 ft., San Andres 4,000 ft., Clear Fork 6,060 ft.

Fisher County: Ellis A. Hall 2-A J. D. Terrell, Sec. 81, Blk. 1, H&TC Sur., 3 mi. N Royston, elev. 1,982 ft., dry, TD 5,030 ft., slight show of oil 960 ft.

Garza County: Ralph Lowe 1 Ruth S. Blake, Sec. 1,200, I&GN Sur., 6 mi. NW Post, elev. 2,668 ft., dry, TD 4,214 ft., Yates 1,430 ft., San Andres 2,530 ft.

SOUTHEASTERN NEW MEXICO

HOBBS.—In northeast Lea County, 20 miles west and north of the Landon pool in Cochran County, Texas, Devonian Oil Co. 1 Federal, approximately NW NW 19-9s-38e, was ready to start testing shows of oil found in the San Andres at 4,945-5,012 ft. Seven-inch casing was set at 4,945 ft. and a test decided on after porosity and saturation was found in the limestone.

New producers were added to the Drink-

ard and Paddock fields last week. Amerada Petroleum Corp. 3 Hare, 33-21s-37e, had Drinkard pay at 6,497-6,530 ft. and flowed 75 bbl. of oil in 10 hours through ½-in. choke. At Paddock, the same company's 3 Baker, 10-22s-37e, flowed 22 bbl. of oil on a drill-stem test at 6,400-96 ft., then set casing before making completion tests.

MISSISSIPPI

Drilling Operations Show Upward Trend During Week

JACKSON.—Drilling operations were reported on the upswing again, with 10 first reports for the week. Adams County had four, Lincoln three, and one each for Forrest, Franklin and Hinds counties. Wildcat reports included Gulf Refining Co. 1 J. A. Rowland, 39-4n-2e, in Amite County, which was drilling below 9,652 ft. Tops logged were Yazoo 3,057 ft., Wilcox 4,892 ft. and Midway 8,102 ft., on an elevation of 261 ft. In Clarke County, Sun Oil Co. 3 Long Bell Petroleum Co., 17-2n-17e, was coring at 4,007 ft. In Holmes County, Skelly Oil Co. 1 W. M. Spawn, 22-14n-1w, was drilling below 6,900 ft. after a drill-stem test at 6,200-19 ft., open 27 minutes, recovered 150 ft. of gas-cut mud and 1,200 ft. of salt water. In Lincoln County, Cook Drilling Co. 1 B. B. Wilson, 4-6n-8e, had base of the Marine Tuscaloosa at 10,429 ft., by cores, on an elevation of 465 ft. It was last reported coring at 10,656 ft. In Wayne County, Humble Refining Co. B-2 G. M. & O. Land Co., 24-9n-8w, was drilling below 7,376 ft. Side-wall cores between 5,640-7,034 ft. recovered sand and shale, with no shows.

MISSISSIPPI WILDCAT FAILURES

Forrest County: Duck & Willis 1 Herchenhahn, NW SW 3-5n-12w, elev. 237 ft., dry, TD 9,005 ft., Midway 4,980 ft., Austin 6,750 ft., Tuscaloosa 7,380 ft., Massive 8,790 ft., Comanche 8,870 ft.

Morgan-Norton 1 USA, SE SW 15-1s-13w, dry, TD 9,503 ft., no tops reported.

Hinds County: Kingwood Oil Co. 1 W. G. Plummer, SW SW 15-5n-1w, dry, TD 3,280 ft., no tops reported.

Washington County: Ormond Corp. 1 Wynn, SE NE 12-17n-8w, elev. 128 ft., dry, TD 6,010 ft., Wilcox 1,760 ft., Midway 3,075 ft., Eutaw 4,220 ft., Tuscaloosa 4,580 ft., Austin 4,856 ft., Cotton Valley 5,470 ft.

Yazoo County: Don Reece 1 T. E. Fouche, NW NE 22-12n-1w, dry, TD 6,505 ft., Wilcox 1,770 ft., Midway 3,893 ft. Eutaw 5,625 ft., Tuscaloosa 6,440 ft.

TEXAS GULF COAST

Wharton County Gets New Gas-Condensate Field

HOUSTON.—A new gas-condensate pool for Wharton County has been opened by Floyd L. Karsten 1-A W. P. Gann, in E. T. Railroad Survey, Section 25. The discovery is located 5 miles southwest of El Campo and approximately 2 miles north of production in the South El Campo pool. Total depth is 7,203 ft. with pipe cemented at 6,600 ft. Operators perforated for production at 5,678-82 ft. and on initial test the well flowed gas and condensate through a 10/64-in. choke with 1,850 lb. pressure.

Johnston & Johnston 1 F. Surkamp, wildcat in the Blessing area, 9,700 ft. southwest of Magnolia Petroleum Co.'s discovery well at Tide Haven pool in Matagorda County, flowed on potential test 38 bbl. of 43°-gravity oil in 24 hours through a 7/64-in. choke with 1,900 lb. flowing pressure on the tubing. Total depth is 10,055 ft., the 5½-in. pipe was set at 9,460 ft., and production is through perforations at 8,533-35 ft. Top of sand is 8,530 ft. Ohio Oil Co. drilled this test to the total depth and then it was turned over to Johnston, Roxie Wright and J. A. Gray who are completing the well.

Twenty-four development and two wildcat locations were reported this week, one wildcat each in Fayette and Liberty counties. West Ranch field in Jackson County received the greatest number of new starts with five reported. There were 10 oil development wells completed, 4 dry holes of which 1 is a wildcat in Wharton County. Hardin County received five completions while Colorado, Fort Bend, Liberty, Matagorda, Montgomery, Orange, Polk, Waller, and Wharton counties received one each.

UPPER GULF COAST WILDCAT FAILURE

Wharton County: P. R. Rutherford 1 Guy F. Stovall, in T. W. Heard Sur., 1¼ mi. SE of oil production at Louise, dry, TD 7,326 ft.

ILLINOIS

White County Has New Oil Producing Area

MATTOON.—White County was assured a new oil producing area about 2 miles south of the town of Concord during the past week when the W. O. Allen et al 1 F. S. Ackerman, NE NE SW 4-7s-10e, swabbed oil at the rate of 5 bbl. per hour. Producing zone is the Aux Vases sand at 2,897-2,913 ft., total depth. Following the swab test, the well was given a 40-qt. shot and is now being cleaned out. Location is about 1 mile south of 2 oil wells in Section 33-6s-10e. The 2 wells in Section 33 are completely surrounded by dry holes, but are at the south end of the Concord field about ½ mile from other wells in the field.

A new pay zone in the Cowling field of Edwards County was opened last week when George Wickham completed his 1 Broster, NW SE NE 34-2s-14w, in the Palestine sand at 2,001-16 ft., total depth. Initial production was gaged at 150 bbl. of oil daily following a 20-qt. shot. Other producing horizons in the field are the Waltersburg at approximately 2,150 ft., Cypress at 2,620 ft., Benoist at 2,770 ft., Rosiclare at 2,860 ft., and the McClosky at 2,995 ft.

Three new pools, three extensions to pools, and two new pays in pools were completed in Illinois during December, according to the monthly drilling report of the Illinois State Geological Survey. New pools were Massilon in Wayne County, Shelbyville in Shelby County, and Omega in Marion County. Extensions were completed to Browns East in Wabash County, Clay City in Wayne County, and Storms in White County. New pays were the Rosiclare lime in the Willow Hill pool of Jasper County and the Devonian lime in the Waverly gas pool in Morgan County.

ILLINOIS WILDCAT FAILURES

Bond County: B. F. Thompson 1 Zahner, SW SE SW 17-4n-4w, dry at 3,111 ft., Cypress sand 824 ft., Benoist 954 ft., Aux Vases 1,004 ft., Ste. Genevieve 1,044 ft., Louisiana 2,035 ft., Devonian 2,120 ft., Trenton 2,940 ft.

Edgar County: Aetna Oil 4 Tate, SW NE SE 33-13n-13w, dry at 530 ft., slight show oil in sand 420-30 ft. and 471-89 ft.

Aetna Oil 3 Tate, 33-13n-13w, dry at 482 ft., Pennsylvanian 437 ft., gas sand 467 ft.

Effingham County: H. Leppert 1 Brunner, NE SW 2-6n-5e, dry at 2,523 ft., Aux Vases sand 2,419 ft.

Fayette County: National Associated Petroleum Corp. 1 Kistler, NE SW NW 17-6n-2e, dry at 2,140 ft., Glen Dean 1,490 ft., Cypress sand 1,689 ft., Benoist

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Jefferson County: National Associated 1 Ward, NE NE NE 23-2s-2e, dry at 2,832 ft., Glen Dean 2,145 ft., Cypress sand 2,398 ft., Benoist 2,546 ft., Ste. Genevieve 2,681 ft., McClosky 2,755 ft.

Madison County: Eason Oil 1 Gillomen, N½ NE NE 11-4n-6w, dry at 1,883 ft., Ste. Genevieve 910 ft., Devonian 1,842 ft.

Moultrie County: National Associated 1 Kimbraugh, SW NW SW 10-12n-6e, dry at 2,060 ft., Fredonia 2,008 ft., McClosky 2,016 ft., St. Louis 2,042 ft.

Shelby County: National Associated 1 V. P. Burgess, NE NE SW 4-9n-6e, dry at 2,322 ft., Glen Dean 1,818 ft., Cypress sand 1,988 ft., Aux Vases 2,160 ft., Ste. Genevieve 2,212 ft., Rosiclare 2,229 ft., Fredonia 2,270 ft., McClosky 2,292 ft.

Wabash County: National Associated 1 Ankenbrand, NW NW NE 19-1s-13w, dry at 2,905 ft., Waltersburg 2,091 ft., Tar Springs 2,165 ft., Glen Dean 2,263 ft., Cypress sand 2,513 ft., Benoist 2,637 ft., Ste. Genevieve 2,771 ft.

CANADIAN FIELDS

N. Turner Valley Gets 400-Bbl. Well

CHATHAM.—In North Turner Valley, Home-Millarville 24, LSD 12, 33-20-3w5, west flank well, finished with Madison limestone at 7,891-8,375 ft., on early tests indicated around 1,000 bbl., apparently all from the upper porous. The lower zone was acidized, and the well produced at the rate of 1,400 bbl. Home Oil has two other tests drilling. Foothills 25, LSD 6, 9-21-3w5, on the west flank of the north extension, is finishing after getting the Madison at 8,627 ft.

Pinhorn.—In the Pinhorn Dome area, southern Alberta, McColl-Union 6D-12-5-10, LSD 6, 12-5-10w4, has been abandoned at 2,293 ft. A new test is being started in LSD 6, 25-4-10w4, near Foremost.

Kinsella.—Additional gas production has been developed by Imperial Oil in the Kinsella field, east-central Alberta. Imperial 25, LSD 10, 10-48-12w4, got 4,066,000 cu. ft. in the Viking sand at 2,215 ft. Imperial 26, LSD 10, 34-47-12w4, finished at 2,153 ft. with 3,550,000 cu. ft. gas. Imperial 19, LSD 11, 28-45-9w4, is finishing.

Lloydminster.—In the Alberta end of the Lloydminster field, Commoil 3, LSD 6, 10-50-1w4, drilled to 1,953 ft., cemented pipe at 1,932 ft. after drill-stem test gave a rise of about 190 ft. of oil from 10 ft. of Sparky sand. The company will drill several additional wells in the spring.

In the Saskatchewan end of the field, recent completions include Community Services 28, LSD 1, 11-49-28w3, total depth 1,873 ft., oil sand 1,851 ft., gas sand 1,710-24 ft., 1,800,000 cu. ft. through ½-in. choke. Community 29, LSD 5, 10-50-26w3, total depth 2,304 ft., waiting test. Community 30, LSD 11, 31-48-27w3, total depth 1,872 ft., oil sand 1,856 ft., gas sand 1,700-26 ft., 470,000 cu. ft. gas through ½-in. choke. United Petroleums 1, LSD 5, 32-48-27w3, total depth 2,032 ft., dry. Northeast Syndicate DB 1, LSD 6, 13-48-28w3, total depth 1,866 ft., oil sand 1,856 ft., gas flow 20,000,000 cu. ft., shut in awaiting further testing for oil. Groat-Furness 25, LSD 16, 12-48-28w3, oil sand 1,840-47 ft., awaiting pump. Oil & Gas Development 3, LSD 2, 28-47-27w3, total depth 2,251 ft., oil sand 1,880-88 ft., shut down. Oil & Gas Development 4, LSD 4, 4-47-27w3, total depth 1,862 ft., gas sand 1,813-19 ft., oil sand 1,824-33 ft., standing.

Nova Scotia.—A possibility of oil production in Nova Scotia this year is foreshadowed by officials of the provincial Department of Mines. At Nappan, near the New Brunswick boundary, Sun Oil Co. has drilled to 8,000 ft. and is equipped to go 15,000 ft., a record depth for Canada.

SOUTH LOUISIANA

Gas-Condensate Area Found In St. Landry Parish

NEW ORLEANS.—A new gas-condensate area has been opened in St. Landry Parish by Stanolind Oil & Gas Co. The 1 Ezeb Guillory, about 2 miles northeast of production in the Bayou Mallet field, in SW 29-6s-2e, in the Swords area, is testing, and on latest gage flowed 80 bbl. of condensate through a 10/64-in. choke with 2,500 lb. flowing pressure on the tubing, and a gas ratio of slightly better than 15,000 to 1. Total depth is 9,861 ft. The 5½-in. casing is cemented on bottom with perforations at 8,952-58 ft.

Gravis & Mitchell 2-J Natalbany, 12-9s-1e, has opened a new deep sand in the St. Gabriel field of Iberville Parish. On a 24-hour potential gage, this well flowed 209 bbl. of 39°-gravity oil through a 7/64-in. choke, with 1,900 lb. flowing pressure on the tubing and a gas ratio of 1,200 to 1. Total depth is 12,331 ft. The 7-in. casing was cemented to 10,375 ft., with 5-in. liner to 10,935 ft. Production is through perforations at 10,818-26 ft. Saturated sands were found from 10,808-33 ft., some oil shows in sands at 10,723-34 ft., and shows from 10,968-81 ft.

Sohio Petroleum Co. 2 Farmers Land & Canal Co., an exploratory test in the Holmwood area of Calcasieu Parish, located approximately 5 miles southwest of the Bon Air field production of Jefferson Davis Parish, has set 7-in. casing at 10,874 ft. Total depth of the hole is 10,876 ft. Operators will drill deeper, using the pipe as protection. No details have been released; however, it is reported a new discovery is expected.

There were 16 new locations this week, 5 being wildcats, 1 each in Acadia, Assumption, Jefferson Davis, St. Charles and Vermilion parishes. Five oil wells and five dry holes were completed, with one of the dry holes being a wildcat in Jefferson Davis Parish.

SOUTH LOUISIANA WILDCAT FAILURE

Jefferson Davis: Sohio Petroleum Co. 1 Adam Bertrand, NE SE 8-8s-4w, 3 mi. SW of China field, in Pine Island area, dry, TD 10,054 ft.

MICHIGAN

Deep Test Slated for West Branch Field

SAGINAW.—In 35-22n-2e, near the center of the fully developed West Branch oil field, Ohio Oil Co. and Pure Oil Co. jointly are completing preparations for a 12,000-ft. test to basement rock.

Michigan field operations in the past week resulted in 14 completions, 1 oil well, a 20-bbl. producer in the Adams-Arenac field; 3 small gas wells, and 10 dry holes. Seven of the failures were wildcats and the eighth wildcat was completed as a small gas producer in Ottawa County.

Nine new locations were announced, 1 each in Allegan and Mecosta counties, 1 each in Barry, Lake, Montcalm, Newaygo and Van Buren. The state conservation department reported 1946 permits totaled 822, highest since 1941 when 1,044 were issued. Most activity was in Allegan County, with 146 permits, followed by Arenac and Isabella with 65 each.

MICHIGAN SUCCESSFUL WILDCAT

Ottawa County, Zeeland Township: Clawson Development Co. 1 Talsma, C SW NE 2-5n-1w, gas well, 325,000 cu. ft., TD 906 ft.

MICHIGAN WILDCAT FAILURES

Allegan County, Caddo Township: Del Fortney-Harris Oil Co. 1 Hartman & Knapp, NE NE SE 25-1n-16w, dry in Traverse, TD 1,157 ft.

Cheshire Township: Circle Drilling Co. 1 Doud, NE NW NW 16-1n-14w, dry in Traverse, TD 1,330 ft.

Wayland Township: Smith Petroleum Co. 1 Walker, NW NE NE 28-3n-11w, dry in Traverse, TD 1,890 ft.

Gladwin County, Butman Township: Charles W. Teater 1 Burke, NE NE NW 36-20n-1w, dry in Dundee, TD 3,731 ft.

Isabella County, Fremont Township: M. Bliss Keeler 1 Johnson, NW NW SE 32-13n-5w, dry in Dundee, TD 3,545 ft.

Ottawa County, Holland Township: Del Fortney-Harris Oil Co. 1 Kooyers, SW SW SE 33-5n-15w, dry in Traverse, TD 1,602 ft.

Tuscola County, Alma Township: Basin Oil Co. 1 Timko, NW NW SE 4-13n-9e, dry in Dundee, TD 2,951 ft.

ALABAMA WILDCAT FAILURE

Geneva County: Shell Oil Co. 1 M. C. Free, C N/2 SE SE 5-2n-19e, dry, TD 3,750 ft., no tops reported.

ROCKY MOUNTAIN

Another Inner Basin Strike for Wyoming

DENVER.—Another inner basin oil pool in the Big Horn Basin, northern Wyoming, appears in the offing in G. & G. Drilling Co. 1 Government, SE NE NW 19-45n-92w, Neiber Dome, Washakie County. The structure lies in the southeastern part of the basin, 12 miles due north of Zimmerman Butte, the nearest field on the south rim, and 18 miles south of the inner basin River Dome, where Pure Oil Co. had a discovery in 1946.

Top of the Embar was picked up at 10,025 ft., the Tensleep at 10,270 ft., Amsden at at 10,437 ft., and Madison at 10,736 ft. Total depth is 10,980 ft. A drill-stem test at 10,173-10,951 ft. resulted in a recovery of 8,840 ft. of mud, water, oil, and gas-cut mud. These horizons below the Embar will be tested later. The 7-in. was set at 10,189 ft. and perforated with 6 holes to the foot at 10,025-55 and 10,070-95 ft. to test the Embar. It swabbed down to 2,300 ft. when the hole began blowing gas with sprays of oil. When connected with the flow line into the pit, it made 30 bbl. in 5 hours and died. It was found that the heavy gas pressure had frozen the tubing a few hundred feet below the surface. This was similar to conditions encountered in the deep Pure Oil Co. wells 18 miles to the north, but which after long experimentation have been mostly overcome. The Embar oil at Neiber is estimated to be around 40 gravity.

Officials of Byrd-Frost, Inc., deny that geophysics had any part in their play in the Kutz Canyon gas field, San Juan County, New Mexico, where they have a potential oil discovery in the Dakota sand. Reports of geophysical background, carried in this column last week, were erroneous, they state, and only surface geology has been used.

Corley test to Madison.—Continental Oil Co. 3 Van Noy, SW SW SE 34-44n-93w, Corley Dome, Hot Springs County, Wyoming, ½ mile north of the discovery well in the Embar last year, will be deepened to the Madison lime for a test after encountering water in the Embar and Tensleep. Tops were Embar, 4,118; Tensleep, 4,343 ft.

South Fork test.—General Petroleum Corp. 88-24-G, SE cor. 24-46n-92w, South Fork, Washakie County, Wyoming, located between Pure Oil Co. wells at River Dome, out in the Big Horn Basin, and the G. & G. Drilling Co. well at Neibor dome, probably will be the next wildcat to yield information concerning the basinward structures. It is bottomed at 10,353 ft., preparing to

run electric survey and then set 7-in. It had the top of the Embar at 10,065 ft., and unconfirmed reports say it showed saturation.

New operations.—Eleven new operations were reported, of which 6 were in Colorado, 1 in Wyoming, 2 in Montana, and 2 in New Mexico. The development wells included 3 in Rangely, and 1 each in Cedar Creek and Kevin-Sunburst. The feature of new operations was the release of locations for 6 wildcats in the first week of the new year, all of which are of outstanding interest. Three are in Colorado, 2 in New Mexico, and 1 in Wyoming.

Completions.—Nine wells were completed, of which 4 were oil, 3 gas, and 2 dry holes. These included 1 oil well in Rangely, 1 dry wildcat in Colorado, 1 oil well each in Wertz and Crooks Gap, 1 dry wildcat in Wyoming, 1 oil well and 1 gas well in Cut Bank, and 1 gas well each in Bowdoin and Cedar Creek fields in Montana.

WILDCAT FAILURE IN COLORADO

North Gramps, Archuleta County: Byrd-Frost, Inc. 1 Taylor, NE SE NE 14-33n-2e, TD 2,892 ft., top Dakota 2,720 ft., show of oil with sulfur water, plugged and abd.

WILDCAT FAILURE IN WYOMING

Mush Creek, Weston County: Mush Creek Syndicate 1 Gov't, NE SW 1-43n-63w, TD 4,040 ft., dry and abd.

OHIO, KENTUCKY

Muskingum County Gets Good Oil Well

COLUMBUS.—Pure Oil 2 L. M. Thompson, Sec. 25-W, Newton Township, Muskingum County, was drilled with a good showing of both oil and gas. After shooting the Clinton at 3,350-92 ft., the well flowed 31 bbl. with 400,000 cu. ft. gas. Offsets to the west and north have been approved.

Hoey et al drilled in their wildcat southeast of Cleveland with only a showing of gas in the white Clinton. The test was on Lynda Merkle, Lot 4, Solon Township, Cuyahoga County. The sand was unusually thick, 3,680-3,807 ft., and the gas showing was shot, but it did not respond and it is expected that the well will either be plugged or the small gas flow used locally.

The Preston Oil Co. completed two good wells in the Hemlock Grove pool, both in Bedford Township, Meigs County. Their 1 Orlando Midkiff, Sec. 3, found the Berea sand at 1,678-92 ft. and after shot made 35 bbl. and 150,000 cu. ft. gas. Their 1 A. C. Willard, Sec. 1, flowed 40 bbl. and the Berea was logged at 1,632-53 ft.

The Industrial Gas 26 U. S. A., lying along the east edge of the Blue Rock pool, in Sec. 2, Blue Rock Township, Muskingum County, had 521,000 cu. ft. gas in the Clinton, 4,425-57 ft., and a good show of oil in the Medina sand at 4,522-28 ft. The Medina sand will be shot and both oil and gas produced.

Six of the 21 locations reported for the week were in Stark County, which was followed by Perry with 4, Meigs 4, Monroe 2 and Ashland 2. Brush Creek led in completions with 7 out of 23.

WESTERN KENTUCKY

OWENSBORO.—The Carter Oil Co. 1 Josephine Johnson, 5-N-23, Henderson County wildcat, last week encountered a slight show of oil in the Cypress sand at 2,228-34 ft. No test was made, however, and operators are drilling ahead below 2,316 ft. In Union County, the J. W. Carter et al 1 Green Heirs, NW SW SW 7-P-20, is drilling ahead below 2,465 ft. after finding the lower Cypress at 2,306 ft. devoid of any oil showings.

Western Kentucky completions showed a decided upward trend during the past week with six oil wells and seven dry holes reported, two of the latter being wildcat failures. New operations announced during the week totaled six, and were located four in Daviess County and one each in Henderson and McLean.

WESTERN KENTUCKY WILDCAT FAILURES

Henderson County: Carter Oil Co. 1 L. Cottingham, 23-O-23, dry at 2,715 ft., elev. 413 ft., Benoist 2,365 ft., Ste. Genevieve 2,526 ft., McClosky 2,569 ft., slight show of oil.

Carter Oil Co. 1 Book, NW NW NW 5-O-24, elev. 411 ft., dry at 2,655 ft. through McClosky.

INDIANA

EVANSVILLE.—Superior Oil Co. is attempting to extend the North Owensville field to Gibson County to the north with their 2 J. Hardiman, NE NW 18-2s-11w. From an elevation of 395 ft., this well encountered saturation in the McClosky at 2,271-74 ft. and drilled ahead to a total depth of 2,371 ft. Casing was then perforated with 30 holes at 2,270-75 ft. and 24 holes at 2,278-82 ft., and a 2,000-gal. acid treatment made. At present operators are cleaning out and swabbing, but results have not been revealed as yet.

Indiana completions during the past week remained at a low level with three oil wells, one gas well and two dry holes reported. Six new operations were reported, and these were located two each in Gibson and Posey counties and one each in Hamilton and Knox. No wildcats were included in either the completion or new operations reports.

CALIFORNIA

Wildcat to Be Drilled In Coal Point Area

LOS ANGELES.—The Coal Oil Point area of Santa Barbara County, long regarded with favor by oil prospectors, is to be the location of another wildcat test to be drilled jointly by Honolulu Oil Corp. and Signal Oil & Gas Co. Site has been staked in the northeast corner of 24-4n-29w, Block A, Island Villa Tract, or about ½ mile from the seacoast where most of the previous prospecting has taken place. Several years ago, Bolsa Chica Oil Corp. drilled two wells—one on state tidelands facing Coal Oil Point and the second from a pier off shore, on the theory that the crest of a structure paralleled the shoreline some 2,000 ft. out in the Santa Barbara Channel. Neither well was successful. The Coal Oil Point area lies about 1½ miles southeast of the Elwood field.

Only other highlight in the Coastal district this week was Chanslor-Canfield Midway Oil Co. 6-G1 San Ardo in 6-23s-10e, Monterey County, which, as indicated last week, is a failure at 8,062 ft. Recovery on a drill-stem test was 650 ft. of gas-cut mud.

In the San Joaquin Valley, considerable drilling activity is likely this year in the Mountain View area where the play is for Schist production, as it was in the nearby Edison area a year ago. Western Gulf has been successful in recompleting its DiGiorgio 1 off the southeast end of the Mountain View field in 10-31s-29e, Arvin area, for 300 bbl. of 31.7°-gravity oil. Well is bottomed in schist at 6,371 ft. There is some indication, however, that production may be short-lived and the importance of the discovery should not be overestimated. Four test wells are drilling or preparing to spud within a 2-mile radius and these may help tell the story.

Loffland Brothers Co., the contractor on Pacific Western Oil Corp.'s world's deepest well, 1 National Royalties in 5-26s-22e, Kern County, are meeting with some success in recovering drill pipe from the hole. There are still 3,000 ft. of pipe in the well, however, and tests have shown that it is actually stuck just above the drill collars but free above that point, which may account in some measure for the success of wash-over and cutting operations to date.

Recent disappointments in the Alondra field of Los Angeles County, discovered jointly by British-American Oil Producing Co. and Texas Co. last summer indicate that the field is very limited in area. British-American 1 Alondra Park, which was believed to be favorably situated, will likely be abandoned following failure of formation tests the past week. The one remaining active well in the area is Brit-

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Use the power of steam, air or water under pressure to lift liquids. Being simple jet pumps they have no moving parts and require no lubrication. A variety of models to meet different conditions. Also used as water heaters.

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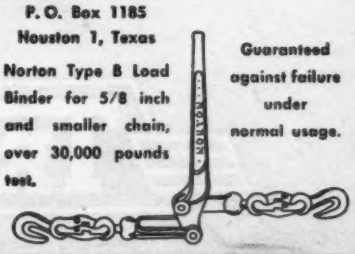

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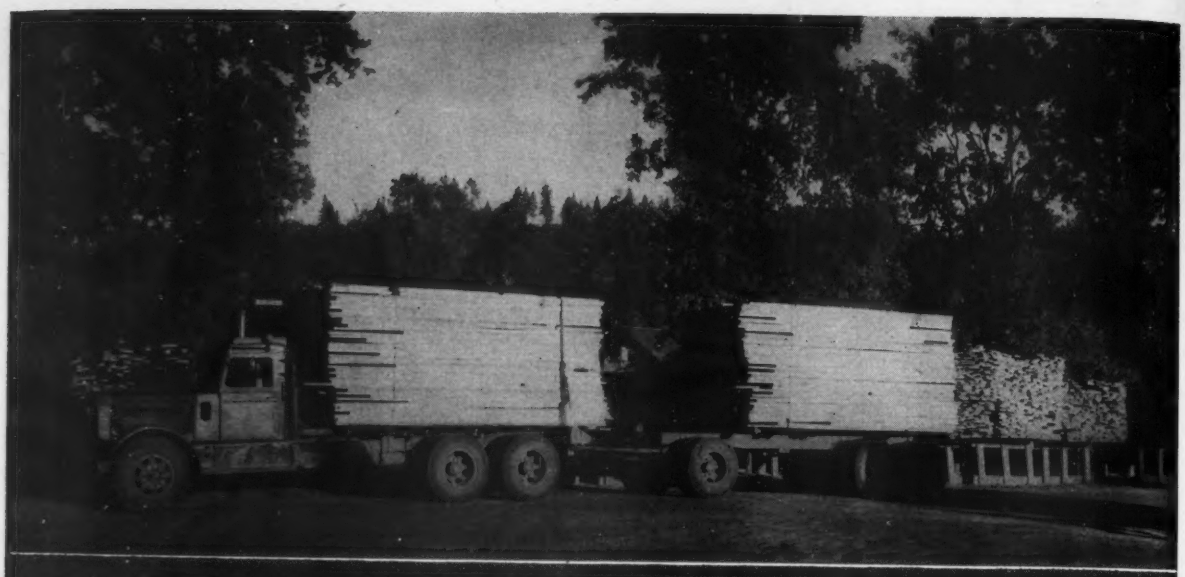

"Easy On Tires!"

Here is a Trailmobile owned by Charles C. Shaw of Placerville, California, which is running on a 24-hour schedule. It hauls rough lumber from the Hassler mill at Placerville to the Smith's Flat mills of the Placerville Lumber Company during the daylight hours. During the night it is used to haul finished lumber to the Bay area, and points between Sacramento and Fresno.

"She's easy on tires," comments Charles C. Shaw, the owner, who drives one shift each day. That is just what you would expect from a Trailmobile which is known the country over as "the easy pulling trailer." They are sturdy in construction so as to stand the gaff, they are carefully balanced so that their "roadability" meets present highway transportation needs. Both spell low maintenance costs for the owner.

For hauling logs from the woods to the mill, or rough and finished lumber to markets and shipping points, you can really depend upon TRAILMOBILES.

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BERKELEY, CALIFORNIA

TRAILMOBILE

ish-American 2 Bodger which is drilling below 7,700 ft. The No. 1 well on the Bodger lease was the discovery well.

Standard of California has given up its attempt to develop production on the east side of the Santa Fe Springs field. The company failed to obtain any showings in 1 Carmenita in 4-3s-11w, and is abandoning the try at 11,367 ft.

CALIFORNIA WILDCAT FAILURES

Kern County, Oildale area: K. R. Mar-Roo Syndicate 1 K.C.L., 18-29s-29e, dry, TD 3,100 ft.

Round Mountain area: Par-Bell Oil Co. 1 Conry, 30-28s-29e, dry, TD 3,006 ft., top Pyramid Hills 1,755 ft., Vedder 1,890 ft.

San Emigdio area: Western Gulf Oil Co. 4 San Emigdio, 19-11n-22w, dry, TD 3,818 ft.

Los Angeles County, Santa Fe Springs area: Standard Oil Co. 1 Carmenita Community, 4-3s-17w, dry, TD 11,367 ft.

Monterey County, San Ardo area: C.C.M.O. Co. 6-G1 San Ardo, 6-23s-10e, dry, TD 8,062 ft.

San Ardo area: The Texas Co. 2A Aurignac, 4-23s-10e, dry, TD 3,165 ft.

OKLAHOMA

Major County Strike Turns Attention to Anadarko Basin

CONSIDERED by many operators as one of the most important strikes in Oklahoma oil history, the R. Olsen Oil Co. 1 Ott, SW SE 4-12n-9w, wildcat southeast of Ringwood in Major County, continued to test as the week closed and was reported showing increased amounts of distillate. Pay is the second Wilcox sand at 8,005-8,124 ft., total depth. On a 30-minute test the well gaged 13,500,000 cu. ft. of wet gas and continued to show mud and drilling water. The test was made through a ½-in. choke, and during the entire test 1 gal. of 59.6°-gravity, light green oil was recovered.

On a test made about 12 hours later, the well was opened and was spraying wet gas in 15 minutes and slugs of mud in 25 minutes. After being turned into the separator, it made 1 bbl. of oil in 5 minutes. Gas was again estimated at 13,500,000 cu. ft. daily. Tubing pressure was gaged at 2,850 psi. and casing pressure at 2,650 psi., shut in.

The Olsen well is the second discovery for Major County, the first being the Superior Oil Co. of California 41-27 Manning, NE NE NW 27-22n-10w, which opened the Ringwood pool. The 1 Manning is now making approximately 20 bbl. daily. The Olsen discovery is considered much more significant than the Ringwood well, however, and is attracting attention of operators to the northern rim of the Anadarko basin, which many geologists believe is the greatest oil frontier in the state.

Another discovery attracting attention to the northern rim of the basin is the H. L. Hunt 1 Light Estate, SE SE 9-6n-21ecm, Beaver County wildcat on the eastern flank of the Hugoton field. Test of the Mississippi section at 6,630-38 ft. resulted in the recovery of 50,000,000 cu. ft. of gas and 30 to 50 bbl. of distillate per day.

OKLAHOMA SUCCESSFUL WILDCATS

Kay County: Westgate-Greenland 1 Wentz, SE SE NW 28-28n-1e, produced 16 bbl. of oil per day from 3,524-40 ft., TD 3,796 ft.

Seminole County: Standard of Kansas 1 Roberts, SW SW SE 15-10n-7e, flowed 234 bbl. of 40.0°-gravity oil per day through 5/16-in. tubing choke from sand at 3,547-59 ft., discovery ¾ mile southeast of SW Sylvan pool, brown lime 3,343 ft., Booch 3,447-69 ft., shale 3,516-47 ft., TD 3,572 ft.

OKLAHOMA WILDCAT FAILURES

Comanche County: Pettigrew et al 1 Carmichael, NE NE SE 15-1s-12w, dry, TD 2,103 ft., no tops reported.

Cotton County: Nantz & Johnson 1 Breman, NW NW NE NE 23-2s-10w, dry, TD 2,501 ft., sand 1,234-45 ft., 1,385-95 ft., 1,478-80 ft., 1,965-75 ft., and 1,980-87 ft.

L. R. Gower 1 Powell, SE SE SW 15-3s-10w, dry, TD 1,807 ft., sand 1,580-95 ft., and 1,731-54 ft.

Fleeger & Bolin 1 Tisdale, SE SW NW 14-3s-13w, dry, TD 2,184 ft., sand 1,639-44 ft. and 1,987-2,002 ft.

C. A. McCann 1 Shaw, NE SE SW 9-3s-12w, dry, TD 2,501 ft., Megargel lime 2,130 ft.

Hendrick & Martin 1 Hurman-Archer, NE NE SW NW 14-3s-12w, dry, TD 1,648 ft., no tops reported.

E. W. Whittaker 1 Zweicker, SE SE SW NW 20-3s-12w, dry, TD 1,800 ft., no tops reported.

Featherstone Oil 1 Bowman, SW SW SW NE 29-4s-12w, dry, TD 2,909 ft., Fusilinide lime 1,863 ft., sand 1,952 ft., lime 2,791-805 ft., lime and shale 2,872-909 ft.

Bridwell 1 School Land "B," SE NW NW 36-3s-11w, dry, TD 1,894 ft.

McDonald 1 School Land, SE SW SW 33-3s-10w, dry, TD 1,526 ft.

Creek County: Cowan & Clarke 1 Cook-Cramer, SE SW SW 14-15n-7e, dry, TD 1,902 ft.

Kadane & Son 1 Douglass, C SE 27-17n-11e, dry, TD 2,564 ft.

Dewey County: Oklahoma Natural Gas Co. 1 Green (Oakwood Unit), NW NW NW 6-17n-14w, dry, TD 12,610 ft., anhydrite 2,810 ft., broken sand and shale 4,400-15 ft., sand 7,974 ft. with good show of oil and gas, Oswego 8,338 ft., lime 8,990-9,010 ft., Oolitic lime 9,790-800 ft., shale 10,364-590 ft., Mississippi lime 10,-704 ft., Hunton 11,440 ft., Viola 12,120 ft., Wilcox 12,420 ft., 2nd Wilcox 12,492-575 ft.

Garfield County: Davon Oil Co. 1 Hempken, SW SW NE 5-23n-4w, dry, TD 6,200 ft., Layton 4,371 ft., Big Lime 4,902 ft., Mississippi lime 5,455 ft., Woodford 5,926 ft., Sylvan 5,963 ft., Viola 5,987 ft., 2nd Wilcox 6,165 ft.

Garvin County: J. E. Crosbie, Inc. 1 Newbern, NW SW SE 15-4n-2e, dry, TD 3,508 ft., Bromide dense 3,165 ft., 1st sand 3,299 ft., sandy dolomite 3,472 ft.

Jefferson County: Sullivan 1 Stallings, SE SW SE 10-4s-4w, dry, TD 784 ft.

Kiowa County: F. A. Callery 1 Shafer, NW NW SW 1-7n-16w, dry, TD 5,880 ft., Hunton 3,670 ft.

Smith & DeBolt 1 Nickle, NW SW NE NW 23-7n-18w, dry, TD 1,242 ft., conglomerate 418 ft. with show of gas at 532 ft. with slight show of oil, brown sand 590 ft. with slight show of oil, sand 820-40 ft. with show of gas, conglomerate lime 1,027-70 ft. with show of oil and 1,105 ft. with show of oil and gas.

Watters 1 Nickle, SE SE NW 23-7n-18w, dry, TD 1,226 ft., conglomerate 961 ft. with show of oil and 1,015-27 ft. with show of oil.

Lincoln County: Wofford, Nicholson & Rose 1 School Land, NE NW SW 16-15n-6e, dry, TD 4,251 ft., Prue 3,059 ft., Mississippi lime 3,810 ft., Hunton 4,074 ft., Wilcox white sand 4,231-38 ft., broken sand 4,238-51 ft.

Carter Oil 1 Walker, C SW NE 22-12n-6e, dry, TD 3,402 ft., Checkerboard 2,150 ft., Oswego 3,000 ft., Prue sand 3,040 ft., Verdigris 3,210 ft., Skinner 3,232 ft.

Logan County: Peppers Refining et al 1 Ewing, SE SE SW 14-15n-2w, dry, TD 6,180 ft., Oswego 5,310 ft., Bartlesville 5,560-65 ft., Woodford 5,622 ft., Sylvan 5,712 ft., Wilcox 5,945-6,018 ft., 2nd Wilcox 6,136 ft.

Payne County: Cities Service Oil et al 1 Wetzel, SE SE SE 9-18n-1e, dry, TD 5,218 ft., Big Lime-Oswego 4,240 ft., Mississippi lime 4,755 ft., Woodford 4,915 ft., no Hunton, Sylvan 4,988 ft., Viola 5,044 ft., dolomite 5,110 ft., Wilcox 5,124 ft., 2nd Wilcox 5,174 ft.

White 1 Mitchell, SE SE NW 3-20n-2e, dry, TD 4,150 ft.

Tillman County: Akin & Dimock 1 Reynolds, NE NE SE SE 4-4s-15w, dry, TD 2,194 ft., hard sand 1,505-09 ft., lime 1,829-31 ft., shale and Granite Wash 1,962-79 ft., Granite Wash 2,010-27 ft., conglomerate sand 2,132-36 ft. and 2,167-72 ft.

Johnson 1 Mount, SW SW SW NW 23-4s-14w, dry, TD 2,284 ft., broken sand 1,578-640 ft., sand 1,806-19 ft.

KANSAS

Morel Pool Receives Westward Extension

BARNETT DRILLING CO. has extended the Morel pool of Graham County ¼ mile to the west with the 2 Anderson, NE NE SW 16-9s-21w. After topping the Arbuckle at 3,689 ft., 5-in. casing was set on top of the formation and the well drilled in to a depth of 3,693 ft. In 1 hour and 10 minutes after the plug was drilled, oil had risen 2,800 ft. in the hole. Operator has now treated the formation with 500 gal. of acid and is preparing to test. The 2 Anderson topped the Arbuckle approximately 9 ft. higher than the 1 Anderson, ¼ mile to the east, which was completed as a maximum 3,000-bbl. producer.

The Wellington pool of Sumner County was extended one location to the southwest during the past week with the completion of Stelbar Oil Corp. 1 McDowell, NE NE NE 7-32s-1w. Initial production of the new well was 200 bbl. daily from the Mississippi chat at 3,663-3,712 ft.

Champlin Refining Co. has added a big Viola lime producer to the Deerhead pool of Barber County with the completion of the 8 Hildebrand, NE NE NE 34-32s-15w. The new well is capable of producing 1,609 bbl. daily according to a Bomb potential test. Only other large well in the field, the Champlin 2 Baird, NE SE 27-32-15w, ¼ mile north of the 8 Hildebrand, which was completed last October for a maximum potential of 3,000 bbl. of oil daily along with 1,000,000 cu. ft. of gas.

KANSAS SUCCESSFUL WILDCAT

Butler County: K. T. Wiedemann 1 Shinn, SW SW NE 19-29s-8e, pumped 30 bbl. of oil per day from Mississippi lime at 2,763-73 ft., TD 2,773 ft.

KANSAS WILDCAT FAILURES

Barber County: Cities Service Oil Co. 1 Smith-Stumph, SE SE NW 24-30s-13w, dry, TD 4,676 ft., Topeka 2,910 ft., Lansing-Kansas City 3,796 ft., Mississippi lime 4,231 ft., Simpson shale 4,545 ft., Simpson sand 4,542 ft., Arbuckle 4,644 ft.

Barton County: Lindas & Stormfeltz 1 Schenck, C S/2 SE SW 35-17s-15w, dry, TD 3,679 ft., Lansing-Kansas City 3,335 ft., conglomerate 3,560 ft., Arbuckle 3,638 ft.

Chase County: Strickler et al 1 Harshman, NE NW SE 29-20s-7e, dry, TD 1,935 ft., Lansing-Kansas City 1,404 ft., granite 1,906 ft.

Cowley County: Patton 1 Brown, C SE SE 34-33s-3e, dry, TD 3,413 ft., Kansas City 2,860 ft., Bartlesville sand 3,380 ft., Mississippi lime 3,408 ft.

Edwards County: Skelly Oil 1 Miller, SE SE SE 15-24s-17w, dry, TD 4,720 ft., Lansing-Kansas City 3,857 ft., Mississippi lime 4,300 ft., Viola 4,432 ft., Simpson shale 4,601 ft., Arbuckle 4,673 ft.

Kingman County: A. G. Hill 1 Woolridge, SW NW NW 35-27s-8w, dry, TD 4,531 ft., Lansing-Kansas City 3,312 ft., Mississippi lime 4,015 ft., Viola 4,327 ft., Simpson 4,371 ft., Arbuckle 4,466 ft.

Rush County: J. M. Huber and E. F. Wakefield 1 Pelz, NE NE NE 10-17s-19w, dry, TD 4,044 ft., anhydrite 1,318 ft., Topeka 3,179 ft., Heebner 3,475 ft., Lansing-Kansas City 3,510 ft., Marmaton 3,780 ft., conglomerate 3,891 ft., Arbuckle 3,997 ft.

STATISTICS and T

WEEKLY WELL COMPLETIONS . . . WEEK ENDED JANUARY 11, 1947

	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1947				
	Comp.	Oil	Gas	Dry	Footage	1947	1946	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	28	14	0	*14	39,873	49	57	0	0	0	0	0	0	0	0	0	0
Pennsylvania	63	29	3	†31	101,134	111	141	0	0	0	0	0	0	0	0	0	0
West Virginia	21	5	12	4	52,486	25	18	0	0	0	0	0	0	0	0	0	0
Ohio	23	6	8	9	68,409	47	22	0	0	0	0	0	0	0	0	1	1
Indiana	6	3	1	2	12,041	20	13	0	0	0	0	0	0	0	0	2	2
Kentucky	13	6	0	7	23,801	19	18	0	0	0	3	3	0	0	0	3	3
Illinois	39	21	0	18	93,240	84	82	0	0	0	10	10	2	0	0	17	19
Michigan	14	1	3	10	33,357	34	21	0	0	1	7	8	0	0	1	10	11
Kansas	72	33	20	19	225,519	131	76	1	0	0	7	8	1	0	0	11	12
Neb., Mo., Iowa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oklahoma	112	44	6	‡62	324,419	182	77	2	0	0	26	28	3	0	0	29	32
Texas	176	114	16	46	735,199	271	323	3	0	1	23	27	7	0	1	42	50
North Central	54	32	0	22	166,977	100	101	1	0	0	12	13	2	0	0	23	25
West	46	40	0	6	180,678	60	76	0	0	0	3	3	1	0	0	5	6
Panhandle	18	6	11	1	55,561	18	16	0	0	0	0	0	0	0	0	0	0
Eastern	16	9	3	4	81,764	16	27	1	0	0	3	4	1	0	0	3	4
Gulf Coast	31	21	2	8	209,399	56	83	0	0	1	2	3	2	0	1	5	8
Southwest	11	6	0	5	40,820	21	20	1	0	0	3	4	1	0	0	6	7
Louisiana	25	15	0	10	150,013	34	35	0	0	0	4	4	1	0	0	4	5
Northern	15	10	0	5	60,796	15	13	0	0	0	3	3	0	0	0	3	3
Southern	10	5	0	5	89,217	19	22	0	0	0	1	1	1	0	0	1	2
Arkansas	10	3	0	7	52,300	10	4	0	0	0	4	4	0	0	0	4	4
Mississippi	13	7	0	6	114,616	18	8	0	0	0	5	5	0	0	0	5	5
Southeastern States	1	0	0	1	3,750	2	3	0	0	0	1	1	0	0	0	2	2
Montana	4	1	3	0	8,378	6	13	0	0	0	0	0	0	0	0	0	0
Wyoming	3	2	0	1	15,733	12	6	0	0	0	1	1	2	0	0	4	6
Colorado-Utah	2	1	0	1	8,325	10	5	0	0	0	1	1	0	0	0	2	2
New Mexico	14	14	0	0	56,344	14	17	0	0	0	0	0	0	0	0	0	0
California	40	33	0	7	139,269	80	67	0	0	0	5	5	0	0	0	14	14
Total United States	679	352	72	255	2,258,206	1,159	1,006	6	0	2	97	105	16	0	3	149	168
Total previous week	480	265	40	175	1,629,856	480	434	10	0	1	52	63	10	0	1	52	63
Total Jan. 12, 1946	572	320	47	205	2,008,796			11	0	2	72	85	13	0	5	108	126

Service wells included: *14, †31, ‡1.

MARKET QUOTATIONS

GRAVITY SCHEDULES

Top prices include all gravities above grades designated, and low prices include all gravities below grades designated:

Gravity—	Signal Hill, Calif.	Oklahoma, Kansas	Gulf Coast Tex.*	West Tex.†
18-18.9	$1.17	...	....	...
19-19.9	1.21	...	....	...
20-20.9	1.24	$1.30	....	$1.17
21-21.9	1.28	1.32	....	1.19
22-22.9	1.32	1.34	....	1.21
23-23.9	1.35	1.36	....	1.23
24-24.9	1.39	1.38	$1.61	1.25
25-25.9	1.43	1.40	1.63	1.27
26-26.9	1.46	1.42	1.65	1.29
27-27.9	1.50	1.44	1.67	1.31
28-28.9	1.54	1.46	1.69	1.33
29-29.9	1.57	1.48	1.71	1.35
30-30.9	1.61	1.50	1.73	1.37
31-31.9	....	1.52	1.75	1.39
32-32.9	....	1.54	1.77	1.41
33-33.9	....	1.56	1.79	1.43
34-34.9	....	1.58	1.81	1.45
35-35.9	....	1.60	1.83	1.47
36-36.9	....	1.62	1.85	1.49
37-37.9	....	1.64	1.87	1.51
38-38.9	....	1.66	1.89	1.53
39-39.9	....	1.68	1.91	1.55
40 and above	....	1.70	1.93	1.57

*For crude from Daboval, El Campo and Sandy Point. †Includes Lea County, New Mexico.

(Quotations shown here are f.o.b. plant in tank cars and in cents per gal. as of last Monday.

REFINERY GASOLINE

Octane (A.S.T.M.)	78-80†	73-75
Mid-Continent*	7.375-7.625	6.750-7.000
Tex. Gulf Coast	7.50-7.75	6.750-7.125
New York Harbor	9-10.75	8-9.25

*Basic Oklahoma Group 3. †1939 C.F.R. (research method).

NATURAL GASOLINE

Grades—	26-70	18-55
Oklahoma (Group 3)	5.000	6.000
N. Texas (f.o.b. plant)	4.500	5.400
N. Louisiana (f.o.b. plant)	4.750	5.700

CRUDE-OIL PRICES

Representative posted schedules per bbl.

East Texas	$1.70
Kettleman Hills, California*	1.69
Beauregard Parish	1.65
Illinois Basin	1.82
Pecos County, Texas (Yates)	1.40
Bradford, Pennsylvania	3.65
Eastern Ill., and Western Ind.	1.67
Tomball, Texas Gulf Coast	1.85

Note: Crude prices exclusive of subsidy.

A.P.I. REFINERY REPORT

Week ended January 4
(Figures in thousands of barrels)

	Dly. crude runs to stills	Stocks Gasoline	Distillate	Residual
East Coast	759	19,824	21,065	8,768
Appalachian	164	3,482	634	503
Ill., Ind., Ky.	801	17,836	5,899	4,125
Okla., Kan., Mo.	385	9,132	2,601	1,236
Inland Texas	236	3,780	506	786
Tex. Gulf Cst.	1,194	14,754	10,465	6,636
La. Gulf Cst.	324	5,378	3,853	1,862
N. La., Ark.	66	1,773	541	125
Rocky Mtn.	138	2,177	486	635
California	832	16,828	11,984	28,609
Total 1- 4-47	4,917	94,964	58,034	53,285
Total 12-28-46	4,968	93,126	58,941	53,427
Total 1- 5-46	4,615	99,393	34,998	41,659

CRUDE-OIL STOCKS

(Bureau of Mines Estimate)

Week ended—	Bbl. of crude*
January 4, 1947	223,291,000
December 28, 1946	225,995,000
January 5, 1946	218,193,000

*Excludes unrefinable Calif. stocks.

TRENDS

DAILY AVERAGE PRODUCTION FOR WEEK

	Jan. 11 crude oil	B. of M. Jan. demand	Jan. 4 crude oil
Alabama	550	1,200	1,150
Arkansas	79,000	76,000	79,000
California	885,000	838,000	883,500
Colorado	37,480	33,000	37,590
Eastern	65,750	64,200	59,000
Florida	240	200	255
Illinois	194,700	209,000	197,000
Indiana	17,200	19,000	18,900
Kansas	189,900	260,000	260,500
Kentucky	29,700	28,000	29,900
Louisiana	416,275	382,000	415,400
North Louisiana	102,650	.....	102,400
South Louisiana	313,625	.....	313,000
Michigan	42,705	46,000	42,225
Mississippi	89,100	62,000	84,495
Montana	22,640	24,000	21,910
Nebraska	550	800	700
New Mexico	103,000	98,000	102,700
Oklahoma	355,800	375,000	364,350
Texas	1,931,615	2,030,000	1,974,850
District 1 (Southwest)	19,085	.....	18,950
District 2 (Southwest)	133,110	.....	134,050
District 4 (Southwest)	206,525	.....	207,825
District 3 (Gulf Coast)	412,175	.....	418,125
District 5 (Eastern)	33,700	.....	34,200
District 6 (Eastern)	99,435	.....	99,400
East Texas field	301,000	.....	309,600
District 7C (West)	27,585	.....	27,550
District 8 (West)	464,725	.....	491,250
District 7B (W. Central)	34,000	.....	34,300
District 9 (N. Central)	118,225	.....	118,100
District 10 (Panhandle)	82,050	.....	81,500
Wyoming	100,180	93,000	102,230
Miscellaneous	.....	600	.....
Total United States	*4,561,385	4,640,000	4,675,655

Change from prev. wk., down 114,270

Total production January 1-January 11 ..... †50,910,175 bbl.

Same period last year (crude plus condensate).... 59,119,000 bbl.

*Not incl. 25,260 bbl. condensate. †Incl. 277,860 bbl. condensate.

CRUDE-OIL STOCKS 223,291,000 bbl. as of January 4—down 2,704,000 bbl. One year ago 218,193,000 bbl.

GASOLINE STOCKS 94,964,000 bbl. as of January 4—up 1,838,000 bbl. One year ago 99,393,000 bbl.

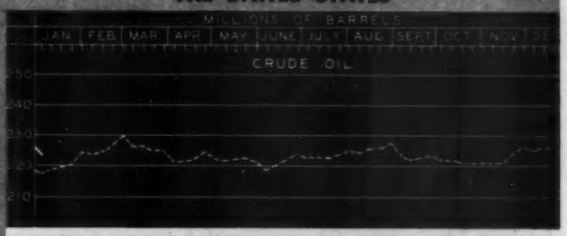
RESIDUAL FUEL-OIL STOCKS 53,285,000 bbl. as of January 4—down 142,000 bbl. One year ago 41,659,000 bbl.

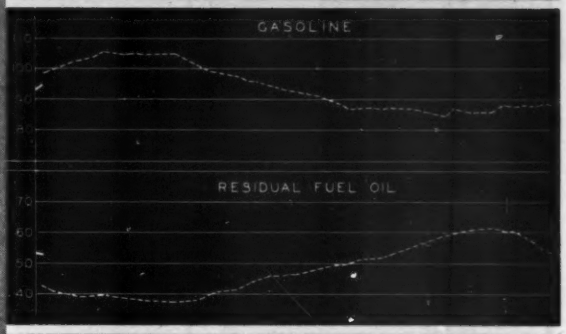
GAS OIL AND DISTILLATE STOCKS 58,034,000 bbl. as of January 4—down 907,000 bbl. One year ago 34,998,000 bbl.

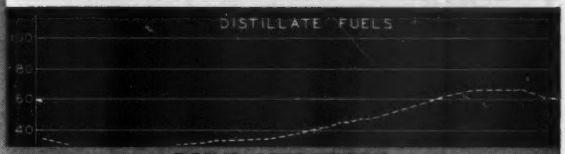
CRUDE-OIL PRODUCTION 4,561,385 bbl. as of January 11—down 114,270 bbl. One year ago 4,579,350 bbl.

REFINERY RUNS 4,917,000 bbl. daily week ended January 4—down 51,000 bbl. One year ago 4,615,000 bbl.

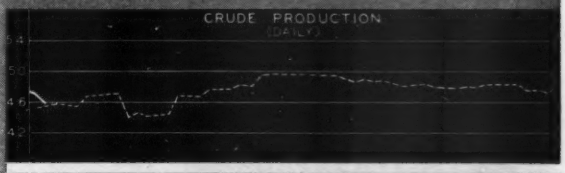
OIL STOCKS IN THE UNITED STATES

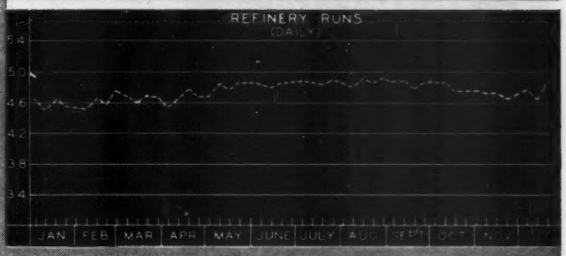




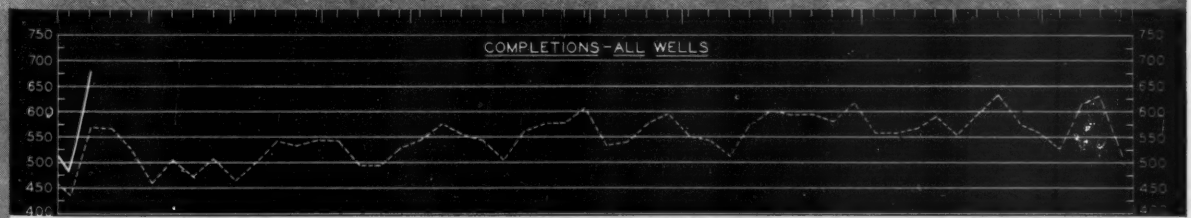


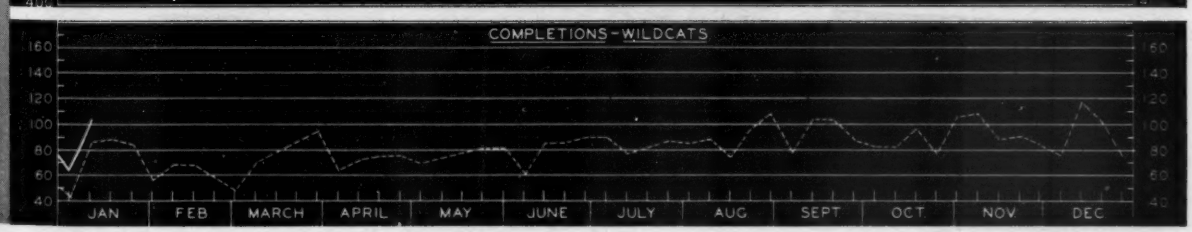
DAILY OPERATIONS





Solid line charts weekly completions, service wells in Eastern area included.





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Simplex No. 322 Cable Reel Jack. Capacity 10-tons, lift 13¾", height 29". For reels 36" to 84" in diameter.

With a pair of Simplex Reel Jacks, heavy reels are lifted easily, and the wire rope is paid out safely and rapidly. Where ground is uneven, use No. 322's. Large braced right and left "T" bases prevent rocking, and permit operators to see each other to coordinate jacking at both sides.

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LEVER SCREW - HYDRAULIC
Jacks
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Better, Safer Jacks Since 1899

Among the Drilling Contractors

T. H. & S. Drilling Co. has been organized in Tulsa, with a capital of $50,000. John M. Withers, Jr., Roger S. Randolph, and J. M. Holliman are the incorporators.

Barnett Drilling Co. was moving in machinery at the 3 Anderson, in NE SE SW 16-9-21, in the Morel pool of Graham County, Kansas. Location is ½ mile south of the No. 2, which had 2,800 ft. of oil in the hole in 1 hour and 10 minutes after the plug was drilled, thus giving a quarter-mile extension to the pool.

Double-R Drilling Co. was moving in material for a Wilcox test southeast of Luther, in eastern Oklahoma County, Oklahoma. The test is the 1 Huntington, in C NE SW 2-13n-1e. Sunray Oil Co., Phillips Petroleum Co., and Skelly Oil Co. are supporting the venture, which is predicated on seismograph and surface work.

Hartman & Jordan, Mt. Vernon, Ill., are contractors on the Carter Oil Co. 1 John C. Leffel, in SE SW 28-6s-14w, Posey County, Indiana.

Calvert & Willis, Olney, Ill., have drilling contract on two wells for Sun Oil Co., in Posey County, Indiana. The tests are the 2 Fred D. Wiley, in SE NE 18-5s-13w, and the 3 Fred D. Wiley, in SE NE 18-5s-13w.

Gas & Oil Industries, Inc., will drill on contract the Carter Oil Co. 1 Jankins, Wilcox sand test in NW NW SW 21-4n-4e, Pontotoc County, Oklahoma.

Big Chief Drilling Co. was moving in tools for a McClain County, Oklahoma, test, some 5 miles southeast of Purcell, and about 7 miles northwest of the Wayne area play. The test, the 1 Terry, is in NW SE NW 30-6n-2w.

Barnsdall Drilling Co. has drilling contract on a test which will be drilled in Bossier Parish, Louisiana, by Barnsdall, Sohio Petroleum Co., and Stanolind Oil & Gas Co. The test, the 1 Johnston, is located in NE NW SE 30-3n-12w, southeast of the Plain Dealing field. Contract is for 7,500 ft.

Roy R. Powers, drilling contractor, Casper, Wyo., was moving in mate-

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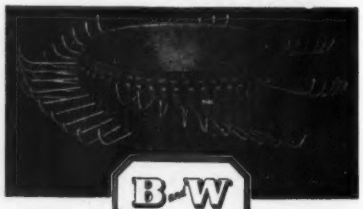

B-W

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You Lose Money When a Cementing Failure Ties Up Your Rig.

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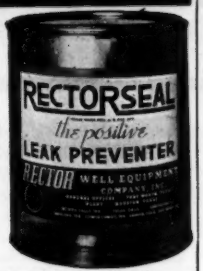
It costs Less to Prevent Leaks

than to stop them!



Don't take chances with oil-soluble thread dopes when making up casing, tubing, line pipe connections; mud, oil, steam, water lines and other drilling rig connections; Christmas tree; separator and flow line connections. Use RECTORSEAL and be sure of permanent leak-proof connections, which will save you expensive repairs later.

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RECTORSEAL
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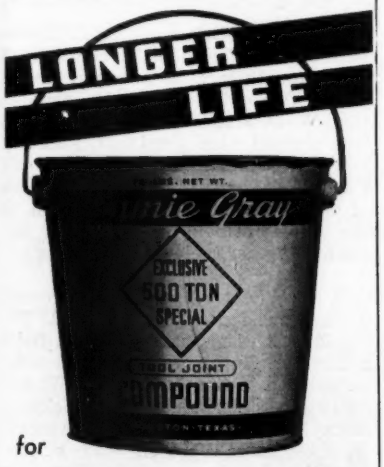

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rials for the Petroleum Industries, Inc., 1 Lovercheck, in C SE NE SE 27-19n-57w, Banner County, Nebraska. Contractor is also drilling the 1 Government-Powers, in the Castle Creek area of Natrona County, Wyoming. Location is in NW NE 19-38n-80w. Drilling operations commenced January 5.

Sanders Drilling Co. is contractor on the Ohio Oil Co. 2 Ural Hayden, in SE SW 3-8n-10w, Sullivan County, Indiana.

Zach Brooks Drilling Co. holds contract on the Atlantic Refining Co. 1 Dunning, which has been staked in C NW SW 12-19n-16e, Clay County, Mississippi. The 9,000-ft. wildcat test is 6 miles southeast of West Point.

J. I. Roberts is drilling contractor on the Warren Petroleum Corp. 1 Jane Heath, in Section 9-10n-8w, Issaquena County, Mississippi. Contractor was rigging up for the test, which is southeast of Cary.

Mealy-Wolfe Drilling Co., Tulsa, is contractor on the Otha H. Grimes 1 J. M. Crawford, SE SW SW 30-9n-11e, Hughes County, Oklahoma. Location is 660 ft. due south of the discovery well of the area, drilled by Texola Drilling Co. and E. K. Carey Drilling Co., which came in last week. Grimes has already located the No. 2 Crawford.

Perry, Busk & Ormiston have been awarded drilling contract on the Clifford A. Peary 1 Edward Schoendorf, in NW SE SW 4-4n-12w, Allegan County, Michigan.

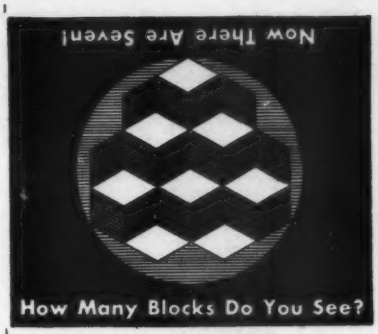
C. B. Miller has drilling contract on the J. W. Lang Co. 1 O. S. Crane, wildcat in NE SE NW 6-1n-15w, Allegan County, Michigan.

Godfrey Drilling Co. will drill the Stuart L. Godfrey 1 John & Della Meshkin, wildcat in SW NW NE 24-1n-15w, Allegan County, Michigan..

Goll, Graves & Mechling are contractors on the J. E. Bauer 1 Kazinier Jurek, in NW SW SW 19-19n-5e, Arenac County, Michigan.

Meredith, Clegg & Hunt, of Houston, are moving in derrick and material to drill Humble Oil & Refining Co. 9 J. O. Phillips, in the Flour Bluff field of Nueces County, Texas. Contract depth is 11,000 ft.

National Drilling Co., Oklahoma City, has been awarded contract to drill Skelly Oil Co. 1 Sissie, in Section 33-8n-7e, Seminole County, Oklahoma.



That's right, six—but turn the page upside down and look again.

BAKER CEMENT RETAINERS

are like that, too. You think you know all of their important applications—such as Re-cementing; Reducing Gas/Oil Ratios; Plugging Off Bottom Fluids; Squeeze Jobs; Cementing Bad Pipe; Plugging Back to Upper Zones; Testing Upper Cased Formations. And then, you find it can also be used as a successful Casing Bridge Plug or to Cement Off to Perforate for Productions. It might pay you to look on page 328 of the Composite Catalog, and it won't be necessary for you to turn the page upside down either.

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PERSONALS

Salt Dome President Pioneers Marine Development

ONE of the most outstanding pioneers in Gulf Coast marine development is Karl F. Hasselmann, president of Salt Dome Oil Corp. His most recent contribution to progress of this kind is reflected in the new Salt Dome drill barge, designed to operate in the 15-ft. waters of Matagorda Bay (The Oil and Gas Journal, November 23, page 62). These are the deepest barge operations ever conducted.

Hasselmann began his career in the oil industry while still a student at Missouri School of Mines by roughnecking during summer vacations. After graduating with a bachelor of science degree in 1925, he became associated with The California Co. as a West Texas field geologist.

In 1927 he served as chief geologist in Germany for Sinclair Exploration Co. In 1929 he joined North European Oil Corp. as general manager with headquarters in Berlin. He remained in this capacity until 1933 when political circumstances in Germany precluded further operations.

It was while in Germany that Hasselman developed a torsion-balance technique particularly suitable for surveys of inundated areas. After leaving Germany, the logical location to further the development of this kind was the Gulf Coast.

Extensive geophysical surveys were conducted by Hasselmann upon his return to this country as president of Geophysicist, Inc. In 1934 that company was merged with Salt Dome Oil, at which time he was elected president and member of the board.

G. E. Maxwell has been appointed manager of the small-craft division, marine-sales department, of Socony-Vacuum Oil Co., Inc. **C. A. McWilliams** has been made executive assistant, domestic, and **R. E. Madsen,** executive assistant, foreign, to **R. G. Coffin,** marine sales manager of the company, in which capacities they will assist in the deep-water activity of the department.

L. W. Storms, graduate of Texas A. & M. College, has been sent to Caracas, Venezuela, in the production department of Creole Petroleum Corp.

Charles E. Spahr has been appointed assistant to the vice president in the transportation department of Standard Oil Co. (Ohio). He joined Standard as an engineer in transportation operation in 1939 and since his return from the Army in 1945 has been industrial-relations assistant in the department.

Aubrey Lee Poynor has been appointed assistant district production foreman of the West Central Texas district of Lone Star Producing Co. Poynor joined the company in 1926 in the compressor department at Breckenridge, Tex.

Clare N. Hurry, district geophysical supervisor for Carter Oil Co. at Shreveport, La., has been transferred to the Tulsa office as an operation assistant in domestic seismograph work. Other Carter transfers include: **George O. Flagg,** engineer with a gravity-meter party at Duchesne, Utah, to Rock Springs, Wyo., as party chief; **Stanley E. Giulio,** assistant seismograph party computer at Rolling Fork, Miss., to Tulsa as a computer on an experimental party; **Roger W. Harris, Jr.,** geophysicist at Texarkana, Ark., to Tulsa as experimental party engineer; **Fred C. Kibler,** engineering trainee, from Carmi, Ill., to Tulsa; **Marvin Romberg,** district geophysical supervisor, from Oklahoma City to Tulsa; **Dwight M. Tedford,** foreman, from Rodessa, La., to Magnolia, Ark.; and **William H. Wurth,** junior geophysicist, from Texarkana to Rolling Fork.

A. B. Weingard, principal stockholder, a vice president, and director of Pennsylvania Refining Co., has disposed of his interests and severed his connections with the company. Weingard, who is president of Continental Refining Co., Oil City, which he and his associates purchased in 1942, said the scope of that firm's refining operations are being expanded.

C. D. Cordy, Gulf Oil Corp., has been elected president of the Fort Worth Geological Society, succeeding **John Wilson,** Independent Exploration Co. **Richard H. Schweers,** The Texas Co., was named vice president to succeed **E. M. Rowser,** of the same company, and **Ray Dudley,** Pure Oil Co. was elected secretary-treasurer succeeding **S. K. Van Steenbergh,** Sinclair Prairie Oil Co.

Stanley H. Cathcart has been appointed bureau chief of the Pennsylvania Topographic and Geologic Survey, succeeding **Dr. Ralph W. Stone,** who retired January 1 after 25 years of service with the state government. Cathcart is a graduate of Pennsylvania State College School of Mines.

M. Darwin Kirk, counsel for Barnsdall Oil Co., Tulsa, has been elected to his fourth term as president of the Osage Oil and Gas Lessees Association. **W. D. Simms,** Shell Oil Co., Inc., was elected vice president, succeeding **G. W. Davis,** also with Shell, and **Clarel B. Mapes,** secretary-treasurer of the Kansas-Oklahoma division of the Mid-Continent Oil and Gas Association, was reelected treasurer.

O. C. Wheeler has been appointed a vice president of International Petroleum Co., Ltd., and **Walter S. Reid,** a director. Both men have had wide experience in South America, Wheeler having been a director in charge of exploration, and Reid, until recently, executive representative of International Petroleum in Peru. In 1944 Wheeler became chief geologist of Imperial Oil, Ltd., the parent company, a position he relinquished on becoming a director of International. Reid has worked for International in Peru and Venezuela the last 25 years.

L. F. Grier, welding foreman of Texas-New Mexico Pipe Line Co., was awarded the President's Medal of the National Safety Council at a recent dinner attended by about 60 operating officials and employes of the company. Grier was credited with saving the life of **W. S. Barrett** by artificial respiration last July after

Barrett had been overcome by gas while working on a pipe line at a crossing of the San Marcos River.

W. L. Huddleston has been placed in charge of the Wichita Falls, Tex., office of Southern Petroleum Exploration, Inc., handling land and geological work.

R. J. Stone, general superintendent of the petroleum-products division, has been named assistant to the general manager of Standard Oil Co. of New Jersey, Louisiana division, succeeding **J. P. Warner,** who was named manager of the chemical-products division. Other division changes include: **H. G. Mangelsdorf,** from manager of chemical-products division to general superintendent of the petroleum-products division; **J. M. Jennings,** assistant process superintendent, to superintendent of refining and oil movement; **C. H. Haynes,** superintendent of refining and oil movement, to coordinator of tank-farm and dock operations; **C. P. Hoyt,** head of the maintenance and construction division, to assistant mechanical superintendent; **Ernest Butterworth,** assistant head of maintenance and construction, to head of the division; **A. J. Ferguson,** safety engineer, to assistant head of maintenance and construction; and **Ed Stauverman, Jr.,** assistant safety engineer, to safety engineer. The changes are a part of the program of Jersey Standard companies of occasionally shifting supervisory personnel to broaden their experience and executive capabilities.

John H. N. Evinger, production engineer with Gulf Oil Corp., has been transferred from Grove, Okla., to Key West, Fla.

Donaldson Brown, for several years a director of E. I. du Pont de Nemours & Co., has been elected a director of Gulf Oil Corp.

H. A. Mason, superintendent of the laboratories at the Torrance refinery of General Petroleum Corp., has been promoted to assistant to the manager of laboratories with headquarters in the corporation's home offices in Los Angeles. Mason will complete his thirtieth year with the company in May.

B. E. Van Arsdale, Casper, Wyo., has been promoted to manager of the land department of General Petroleum Corp.'s Rocky Mountain district.

Dr. L. A. Mikeska has been appointed senior research associate of Standard Oil Development Co. Dr. Mikeska has served in the development company's chemical division since 1930.

Roy Beckelhymer, Houston consulting geologist, has gone to Panama, where he will serve in a consulting capacity for about 3 months. He will reopen his Houston office upon his return.

M. W. Taylor, Jr., petroleum engineer with Magnolia Petroleum Co., has been named district engineer at Alice, Tex., to succeed **C. W. Kelley,** who has been transferred to Vanderbilt, Tex. In another Magnolia transfer, **John H. Miskell,** petroleum engineer, has been moved from Salem, Ill., to the Chase, Kans., district with headquarters at Ellinwood.

Robert J. Torrens, formerly a superintendent for the Foster Wheeler Corp., will leave San Francisco January 24 for Shanghai and then Formosa, where he will become chief engineer for Chinese Petroleum Corp., which is under the National Resources Commission of the Chinese Government.

Shifts

C. D. Johnson, geologist, Sinclair Oil Co., Oraibi, Fla., to Albuquerque, N. M.; **J. C. Scherer,** engineer, Signal Oil & Gas Co., Goleta, Calif., to Long Beach; **L. L. Chisholm,** superintendent, Danciger Oil & Refining Co., Fort Worth to Shawnee, Okla.; **M. J. Millet,** foreman, The Texas Co., Kinder, La., to Vinton, La.; **R. W. Blackburn,** engineer, Continental Oil Co., Villa Platte, La., to Ponca City, Okla.

Dan J. Grady, Jr., engineer, Shreveport to Natchez, Miss.; **R. B. Chesney,** engineer, Barnsdall Oil Co., Patmos, Ark., to Benton, La.; **J. P. Garner,** geologist, Oil Exploration Co., McLeansboro, Ill., to Vernon, Tex.; **R. R. Hawkins,** engineer, Case, Pomeroy & Co., Inc., Lexington, Ky., to Los Angeles; **William L. Giezentanner,** engineer, Wichita, Kans., to Henryetta, Okla.; **Robert M. Caywood,** engineer, Stanolind Oil & Gas Co., Oklahoma City to Vivian, La.

Officials and directors from the Toronto headquarters of British American Oil Co., Ltd., on an inspection tour of properties in the United States, are shown here as they were greeted in Tulsa by officials of the company's two subsidiaries, British American Oil Producing Co. and Toronto Pipe Line Co. After leaving Tulsa the group visited Oklahoma City, Los Angeles, Casper, Wyo., and Chicago before returning to Toronto. In the front row, left to right, are Robert E. Kepke, vice president, British American Oil Producing Co. and vice president and general manager, Toronto Pipe Line Co., Tulsa; F. M. Oglesby, manager of the land department, Tulsa; C. L. Suhr, director, British American Oil; Miss Shirley Land, airline hostess; J. G. Godsoe, executive vice president, British American Oil; G. A. Dobbie and F. A. Gaby, both directors of British American Oil; C. D. Miller, vice president and general manager, British American Oil Producing, and vice president, Toronto Pipe Line; J. H. Turnpenny, director of public relations, British American Oil; M. S. Beringer, vice president in charge of manufacturing, British American Oil; and A. H. Miller, vice president in charge of sales, British American Oil. In the back row are J. H. Wolfe, purchasing agent, British American Oil Producing; Mayo E. McKeown, attorney, British American Oil Producing; C. J. Kerwin, general manager, production department, Tulsa; William K. Whiteford, Toronto, president of all three companies; Paul van Maanen, copilot; L. J. Belnap, director, British American Oil; J. J. Arps, chief engineer, British American Oil Producing; A. D. Small, engineer in charge of engineering and statistical division, British American Oil; H. H. Bronsdon, treasurer, British American Oil; and D. S. Zimmerley, pilot

Equipment Men in the News

Century Geophysical Opens Houston Office

Century Geophysical Corp., Tulsa, announces the opening of a sales and service office at 223 Neils Esperson Building, Houston. In charge of the new office is C. C. Hutchinson, who has specialized in experimental reflection seismograph work.

Carpenter Sales Representative For National Supply

Harry R. Carpenter has become special sales representative of The National Supply Co. in the midwest division, according to A. W. McKinney, vice president and general manager of sales. His office will continue to be in Bartlesville, Okla., where he has made his headquarters since 1915.

Gumpper in South America For Ready-Power

Harold D. Gumpper, president of Ready-Power Co., left Detroit in December to begin an extensive trip into South America. At Buenos Aires, Gumpper meets the director for South America of International Harvester Co. and together they will spend 2 months calling on dealers who sell the companies' products.

Lincoln Completes Pan American Tour

James F. Lincoln, president of The Lincoln Electric Co., has just returned from a Pan American tour covering several months, during which time he visited San Juan, Puerto Rico; Rio de Janeiro, Sao Paulo, Porto Alegre, Brazil; Buenos Aires, Argentina; Port-of-Spain, Trinidad; La Guarira, Barranquilla, Colombia; Caracas, Venezuela. He was accompanied by R. A. Edwards, manager of distribution, Armco International Corp., Middletown, Ohio, who acts as Lincoln representative throughout the area covered.

Jones & Laughlin Opens Sales Office

To operate in connection with its store at 234 Southeast Twenty-ninth Street, Oklahoma City, Jones & Laughlin Supply Co. are opening a sales office at 402 Kerr-McGee Building, William J. Whatley will handle city sales from this office. These facilities are a part of the central and southern Oklahoma district under supervision of L. R. (Mike) Roberts, district sales manager, Wewoka, Okla. Included in the district is a new store now being opened at Pauls Valley, Okla.

New Stores for Continental Supply

Continental Supply Co. has opened a new store at Brookhaven, Miss., with J. R. Osteen, manager. This point will be under the supervision of E. N. Wood, district manager at Shreveport. Another new store began operation January 2 in McAllen, Tex., with W. O. Bright manager. The store will be under the supervision of W. G. Fitzpatrick, district manager at Houston. Other appointments include A. P. Lacey as assistant district manager of the South and Southwest Texas district with headquarters in Corpus Christi, and R. L. Collier as district manager of the North and West Texas-New Mexico district with headquarters at Fort Worth.

Engineering Service Company Formed

Formation of The Marshall-Moorman Development Co., a partnership to offer a consulting and process engineering service to the petroleum and chemical industries on specific new applications of the fluid-catalyst technique, has been recently announced. Walton H. Marshall, Jr., and Joseph W. Moorman, both formerly with M. W. Kellogg Co., New York, are the organizers of the new firm, with offices at 19 Rector Street, New York.

Liberty State Becomes National City Bank

The Liberty State Bank has become the National City Bank of Dallas, effective December 30, 1946, according to an announcement by DeWitt Ray, president. He emphasized that there will be no change either in personnel or in the banking policies which have characterized the bank in the past.

Department Changes In Quaker Oats

Lauren B. Hitchcock has been appointed vice president in charge of the chemicals department of The Quaker Oats Co. Since 1944 Dr. Hitchcock has served as manager of the chemicals department in the development of furan chemicals. Fredus N. Peters, Jr., former director of research, has been appointed vice president in charge of chemical research. Frank F. McKinney was recently made sales manager of the chemicals department.

Union Wire Rope Expands Technical Staff

Appointment of Walter Voightlander as technical director has been announced by Union Wire Rope Corp., Kansas City, Mo.

W. VOIGHTLANDER

CHARLES M. ZERR

Charles M. Zerr, for the past 12 years assistant to Voightlander, has been appointed chief engineer of the rope division. Other advancements in the enlargement of the company's technical service include: Raymond O. Kasten as assistant technical director; Robert C. Downey, research chemical engineer; Omer Brenton, assistant metallurgist; and Dwain L. Bedford, metallurgist in charge of the chemical, physical, and metallurgical functions of the laboratory.

Production Equipment Opens New Store

Production Equipment Co., Inc., subsidiary of The Buda Co., announce the opening of its new store location at Bakersfield, Calif.

Kincaid Tennessee Valley Representative

Pittsburgh Lectrodryer Corp., Pittsburgh, has announced appointment of Wendell V. Kincaid as sales representative in the Tennessee Valley with headquarters in Knoxville. He became associated with Lectrodryer in 1942 and has served in that firm's Chicago office and Pittsburgh plant as a sales and service engineer.

Nagel Vice President of Benson & Associates

Robert E. Nagel has been elected vice president of Benson & Associates, Inc., an organization composed of a group of technologists specializing in industrial accident-prevention engineering through analysis, research, development, design, and sale of all types of safety and fire-fighting equipment.

Knoll Joins Republic Supply

CARL L. KNOLL

Announcement has been made by Republic Supply Co. of the appointment of Carl L. Knoll as sales representative with headquarters and office at Bartlesville, Okla. He will work the northern Oklahoma and southeastern Kansas territory from this point which is under the supervision of J. H. Brooks, vice president and district manager with headquarters at Tulsa.

Petroleum Equipment Changes Name

Effective January 2, 1947, Petroleum Equipment Co., a wholly owned subsidiary of Bethlehem Pacific Coast Steel Corp., will be known as Bethlehem Supply Co. of California. The announcement was made by H. H. Fuller, president of both companies. G. W. Schweinhard, vice president and general manager; Wendell M. Jones, vice president, and other personnel of the company will continue in the same capacities under the new name.

Fetzer Elected Vice President

Announcement is made of the election of A. C. Fetzer, vice president, to the board of directors of Mack Manufacturing Corp. Fetzer, who was acting general sales manager, was at the same time appointed general sales manager.

Playford New Resident Manager

Norman P. Playford has been appointed resident manager of the Winnipeg office of United States Steel Export Co., succeeding William P. Walton, who is retiring after 43 years of service.

ACF Appoints Seiler

Announcement is made by American Car & Foundry Co. that J. D. Seiler has been appointed assistant works manager of the Milton, Pa., plant which specializes in the building of tank cars, tank-car tanks, and storage and pressure vessels.